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XXV.

ANAPHYLAXIS AND ALLERGY IN RHINOLOGY.*

BY FRANCIS P. EMERSON, M. D.,

BOSTON.

Biologically it has been shown that after the amino-acids have been elaborated by the action of the enzyme on the foreign protein, any remaining protein not so acted upon is exceedingly poisonous, and when injected into the body in any considerable amounts, produces anaphylactic shock. The clinical picture of anaphylaxis is familiar to all when manifest as an attack of hay fever or asthma. The biological picture is also definite and understandable but the underlying cause of protein sensitization is not so clear. We know that if the remaining protein passes through the gastroenteric tract it is further broken down into harmless amino-acids. Now, in protein sensitization, when the foreign protein comes in contact with the living cell, without the intervention of normal digestion, is it not possible that such cells are hypersensitive because of some change acquired since birth, and not because of an inherited

*Read before the American Laryngological Association, Atlantic City, N. J., May 22, 1929.

constitutional weakness, which in all other diseases is predisposing only? In certain cases we must believe that some prenatal cause existed, as is shown by the allergic manifestations in infants when first given cows' milk. Only 8 to 10 per cent of all cases show protein hypersensitiveness. Therefore, we only have to account for this small number in finding some common cause which will be convincing in proportion as this cause is found to be constant for all.

Anaphylaxis is defined as an antibody-antigen reaction, while in the allergies antibodies have not been found. Clinically, the symptomatology is the same in every detail. Moreover, the same individual may be subject to asthma, hay fever, eczema, and react to a variety of foods. When the protein sensitization is marked these reactions may vary from week to week. From a clinical standpoint, then, the picture is the same for anaphylaxis and allergy. Is it not a problem for the biologist rather than the clinician to point out the essential difference, and although antibodies have not been found in allergy, to show that it is certain that they are not there? In this problem the biologist has signally failed. The literature is replete with articles on the subject of anaphylaxis, allergy, protein sensitization, etc., but with one exception they all deal with attempts to protect the patient from the exciting antigen or to establish immunity.

These allergic manifestations as the result of protein sensitization to different articles of food, may result in marked reactions with symptoms confined to the mucous membranes, skin, nerves, circulation, gastroenteric tract, etc., and these reactions may be mild, producing only discomfort in the patient or may threaten his life. Protein sensitization, whether of bacterial or nonbacterial origin, will have these same clinical manifestations, but the clinical literature has dealt mainly with the nonbacterial class, probably because it was more easy to discover the foreign protein and to establish immunity by the exhibition of small doses or to withdraw the offending food entirely.

In this paper drug and serum allergy will not be considered separately, as our observations have had to do largely with hay fever and asthma. The phenomena of toxin hypersensitiveness and tubercular sensitiveness will also be excluded.

Toxin hypersensitiveness, because its symptoms are not different from those of the normal effects of the toxin; the latter, because its symptoms are the same in all animals and because they are different from those of hypersensitiveness to any other substances in any animal (Coty). It might be added, however, that clinically the basic process that accounted for the production of toxins might provide favorable soil, so that an exciting antigen substance might be followed by allergic phenomena in an individual who would not otherwise be susceptible. Theoretically, it is true that anaphylaxis may be due to the failure of a specific antigen to elaborate amino-acids sufficient to render the ingested foreign protein harmless. It is also true that there is an inherited protein susceptibility, as in the cases of Schloss, published in the Canadian Medical Association Journal, May, 1925, of children sensitive to protein, where, in a group of 80 cases, he found a definite history of similar disturbances in the parents, brothers or sisters in forty cases and a history extending to the grandparents in seven cases. These cases showed marked hypersensitiveness to diluted cows' milk. Protein sensitization or allergy does not explain the cause of the change in the living cell that has altered its normal reaction so strikingly. In the biologic failure to offer a structural basis of antigen specificity some writers have suggested that such reactions be all classified under the term "allergy" and that anaphylaxis, protein sensitization, etc., as separate terms be dropped. One writer believes that hay fever is only an early manifestation in the development of a frank asthma.

Certain it is that asthmatic patients, as a rule, have hay fever, and many also suffer from eczema, urticaria, etc. Hyperesthetic rhinitis has been classed as an allergic manifestation. Cases have been recorded where desensitizing sera have been used in bacillary dysentery in patients suffering from eczema and urticaria, which were followed by asthma. (Jose C. Laveriza, Philippine Islands Medical Journal, 1925.) Allergic substances in the air, cold and acquired hypersensitiveness that may be seasonable or all the year round, that are manifest at one time as hay fever, asthma, vasomotor rhinitis, etc., is simply unstable cell equilibrium from some unknown etiology.

While the question of a structural basis of antigen specificity is not our problem at this time, yet we must have something on which to base our clinical attack. G. Milian, La Presse Medicale, 34, 1575-1576, December 15, 1926, says, speaking of anaphylactic shock: "It is necessary that there be a previous lesion of the endocrine sympathetic system to insure such an accident. All sorts of bodies cannot give rise to nitrotoid crises. It is usually necessary that they be vasodilator or, at least, poisons of the endocrine sympathetic system. If this system is normal it resists the toxic action of these substances, but if it is altered, toxic action is felt after a therapeutic dose, while in a healthy subject they are absolutely innocent. Many phenomena supposedly due to shock are what may be termed biotrophic phenomena, and are more important than vasoparalytic phenomena because of their greater frequency. The name, biotrophic phenomena, indicates the affinity of chemical substances for microorganisms, provided that they stimulate their vitality in place of destroying it." Many of these vasomotor reactions can be traced back to childhood, following a definite bronchopneumonia, measles, etc. Can the underlying cause be the same thing? At once we are confronted with the question as to whether there is a bacterial and a nonbacterial allergy. If the underlying cause that makes the patient hypersensitive is of bacterial origin, any reinfection will be likely to bring on his original symptoms temporarily, however modified.

Hay Fever Treatment.—In the treatment of hay fever the most success follows those cases that come on in the spring and in which there is a pronounced reaction to one or two grasses or pollens. Reaction to a dozen or more should be ignored as far as expecting any result from specific sera. In all cases, whether a serum is used or not, any local pathology that makes the tissue hypersensitive should be corrected. In an established case the serum should be started weeks before the expected onset. Many of these patients with hay fever have also a chronic maxillary sinusitis with fibrosis, the same as we will find present in all our vasomotor cases.

Asthma.—In the investigation of 1,000 cases of asthma by Dr. Harold Tobey and Dr. Rackemann they have come to the following conclusion: that there is no specific vaccine; that a stock vaccine is as efficacious as an autogenous vaccine, and

that any improvement is by increasing resistance by improved metabolism. Dr. Tobey found in these 1,000 cases that approximately 65 per cent showed pathology and felt that there was a decided benefit in operating. On going over the case records, however, he came to the conclusion that while the patients' general conditions improved following the removal of definite pathology, there was no greater percentage of cases improved or cured than in the nonoperated on patients. Twenty years ago Schadle of St. Paul noticed that all of his cases of vasomotor rhinitis were improved following lavage of the antrum through the normal opening. Fourteen years ago the writer, in washing out the antrum, floated out a large, gelatinous mass, and feeling that this indicated pathology, and as the patient had symptoms pointing to the antrum, it was opened through the canine fossa. In the bottom of the cavity and opposite the middle turbinal region was a large, cystic mass with serum in the cavity. As the process seemed diffuse the entire lining membrane was removed. The patient did so well that this practice has been continued ever since. Later, sections of the lining membrane have all shown, in this type of case, a diffuse fibrosis with round cell infiltration, which indicates chronic infection. In other words, there were no cases with circumscribed areas, thus confirming the findings made and reported in an exhaustive paper by Tunis of Philadelphia as early as 1911. The diagnosis is not easy, as the X-ray and transillumination may both fail in giving us any information. There is no demonstrable discharge. At first, it was thought that the membrane must be replaced by scar tissue, but Knowlton, working in Mosher's laboratory, demonstrated on dogs that the membrane entirely regenerates from extension in from the nose in about five months. (We should bear in mind that this is a chronic maxillary sinusitis with fibrosis and infiltration without pus and the membrane only relatively thickened, so that transillumination is more clear than normal, and we are not considering any other type of chronic infection.)

Some ten years ago Coakley of New York claimed that all that was necessary in treating these cases was to establish drainage and ventilation. Others considered them to be cases of run out infection. Very few looked upon such an antrum as a potential menace. It is this type of antrum that is usually

associated with vasomotor symptoms. During the last year several articles have appeared substantiating the claim that such antra with fibrosis and without pus are associated as a focus of infection with the most serious systemic conditions.

In bacterial allergy we have quite a different problem from the nonbacterial type, for it is evident that if the patient has become hypersensitive to a certain type of infection, the operation is merely one step in the beginning of treatment, for no operation, however skillfully done, can possibly remove all the infection, nor can immunity be established in a short space of time. Not only should the patient's habits and environment come under supervision, but he should be told that it is useless to operate unless he is willing to report over a period of at least a year. Whenever there is a reinfection there is bound to be an allergic reaction for some time if that type of infection had anything to do with the sensitization.

Treatment.—One case reported by Sluder (Annals of Clinical Medicine, May, 1925) was cured by injection of the sphenopalatine ganglion, although chronic bronchitis and emphysema were present. This, however, is destroying the sentinel without removing the cause.

All cases of asthma under observation have been associated with chronic maxillary sinusitis with fibrosis and infiltration and operated on by doing a Caldwell-Luc operation and removing the entire lining membrane. All cases operated on do well while in the hospital following operation, although they may have had daily attacks for weeks before. This is probably not due to the operation but to an antigen free atmosphere and the changed mental state. The morbid mental relation of the family and the patient is a real condition to be met, nor must we forget the endocrine sympathetic syndrome requiring a metabolism test and the proper medication. We should have a vaccine made in every case and, if necessary, use it as a help in convalescence. Many cases should be bronchoscoped and treated locally, followed by an injection of the Jackson solution for asthma. Occupational therapy and treatment in a sanatorium would be ideal.

An understanding of the pathology of the type of antrum so often associated with vasomotor conditions has only been

recent. Some fifteen cases have been studied by the writer with results that justify further investigation. Any statistics, however, that do not cover a period of two years for each case are of no practical value, hence this paper must be considered a preliminary report. Tentatively, it may be said that one case, aged nine years, having had asthma since ten months old, has gone two years. Second, Mrs. A., aged fifty-four years, having had asthma for twenty years, has had but minor attacks with acute infections and has been free from it six months at a time. Third, B. W., aged six years, who had had asthma for five years and had been housed all winter on account of frequent colds, has been free from asthma for one year. Fourth, C. P., aged twelve years, suffering from asthma for eleven years, has been free from it for about one year. This was a very severe case, with general eczema since thirteen months old, which nothing helped until the chronic infection was relieved. Fifth, Mrs. H., aged sixty years, has had no asthma since operation a little more than a year ago, although she had been a sufferer for two years and had been housed all one winter. Many other cases have not been observed over a year, but all have made such progress that it seems worth while following up this line of investigation.

XXVI.

THE COINCIDENCE OF MENINGEAL CALCIFICATION AND NASAL PATHOLOGY.

By James A. Babbitt, M. D.,

Philadelphia.

The selection of this title was made with great care and should be accepted at its face value. It was not its purpose to claim or even suggest etiologic sequence. Its keynote is coincidence, perhaps some correlation but not etiology. Its "raison d'être" is the writer's increasing interest in osseous changes which have been noted in patients having deep sinusitis and the rather accidental opportunity of recording the incidents of one particular case of special interest, whose convalescence perhaps has not yet had sufficient time interval for positive data—and not least to record particularly before this association any case of importance.

The problem of the atypical neuralgias, and the unwillingness of opinion which is really worth while to give etiologic evidence to focal background, make any investigation in the field of this heading of deep interest—the unsuccessful records of relief make the problem of greater interest and mayhap some ultimate findings may add some further importance to the ethmoid and other sinus areas which have already so contributed to asthmatic relief.

This paper will review the history and impressions on this subject, discuss what is known about the principles involved in cerebral calcification, cite some of the coincident features as presented with nasal pathology, present an interesting case for discussion and try to draw a few simple conclusions.

In reviewing the literature on this subject, one is impressed by the widespread attention it has evoked, and the multiplicity of reference is quite sufficient to disillusion the thought of any new discovery. While the significance of ossification and calcification of the meninges has aroused the speculative interest of observers for a long time, the general impression seems to have been that the conditions found represented a

finality, whose completed process has little pathologic menace. Responsibility for this in a measure goes to Virchow's[1] lectures in the latter part of the nineteenth century, who insisted upon the benign character of these pathologic changes and who so checked the enthusiasm that comparatively few cases have been reported since 1870. To us as laryngologists the interest lies in the possible establishment of sufficient connection to furnish added diagnostic interpretation of deep perisinusitis, and, as noted above, afford another link in the baffling study of atypical neuralgias.

Calcification of the meninges in animals is quite common, occurring in the falx of the dolphin, seal and the platibus, in the tentorium of cats, bears, horses and pachyderms.[2] In man it is less common but not rare. The first case on record occurred in 1557.[3] Two cases were reported in 1761,[4] one apoplectic, one syphilitic, with severe headaches and convulsions. Isolated cases were recorded in 1780, 1859, and in 1866 in 625 autopsies 64 cases were found and reported.[5] Then comes the quietus from Virchow, with only a few isolated cases. Sixty-three cases of osteoma of the arachnoid appear in the literature of 1889, recorded by Zanda.[6] This condition is also reported in a considerable number of cachetic subjects, especially in the insane and epileptic.[7]

There is little presented indicating pathologic coincidence or relationship to sinus pathology. According to Halstead and Christopher,[8] "the ossifications are generally found in the falx; alongside the superior longitudinal sinus, especially where the falx is inserted into the crista galli, less frequently in other parts of the dura, and most rarely in the tentorium cerebelli. They are never found in the dura which covers the base of the skull." This is hardly in accord with the work of Hirtz and Worms,[9] in France, on the radiographic signs of the extension of deep sinus infections to the base of the skull and midbrain —the condition termed "perisinusite profonde," as cited by Pfähler[10] in his own excellent paper.

Pfähler divides these cases at the base of the skull into two classes: those affecting the sella turcica and adjacent structures; bands, bridges, calcified ligaments, periostoses and hyperostosis. He refers to Hirtz's[11] series of 144 cases studied in relation to the pineal gland. Calcification was found in 56 per

cent of the cases, but calcification was not found without associated evidence of deep perisinusitis.

The matter has been summed up by McKendree-Imboden[12] in this excellent description: "The falx easily assumes first place as the most common site. The region of dura, alongside the superior longitudinal sinus, and the tentorium are next in frequency. All the areas of the convexity, however, may be affected.

The dura is frequently involved alone, or may be the seat of a process involving the other tunics. Again calcification may have its origin in the pia arachnoid, leaving the dura free.

The osseous formations may be in the form of isolated plaques, minute, multiple, in clusters, isolated or fused to form plates encasing the entire convexity. They may be pyramidal or stalactite in form. The meninges involved usually show a congestion of the vessels and adhesions are frequently observed."

Calcification is usually a matter of mature age, but a case is described[13] in a twelve-year-old girl.

It is not the intention of this paper to present a stereotyped review of all opinions recorded in the literature, but rather obtain in composite the general impression with careful reference list. Dr. Loudenslager, who has assisted in the reference search, comments on the numerous allusions from surgeons and pathologists, who, in commenting on the formal papers read, allude to personal experiences not officially recorded.

Embryonic changes, as suggested by Ribbert,[14] may play a considerable part in the background of this process where the dura functions as a periosteal layer of the skull, and may contribute to the osteogenetic process. It would scarcely be reasonable under such influence to place the slightest connection of such bone plate formation with deep sinusitis. It might be assumed that such was pure coincidence. Experimental work has been reported by Hofmeister,[15] Tanaka[16] and Wells[17] on the physiochemical factors and variations in CO_2 concentration relative to the solvent power of body fluids in producing erosion and resorption of bone surfaces.

As to the direct principles involved in meningeal calcification and their connection with deep sinus infection, four primary phases have been suggested:

Inflammation caused by trauma,
Nutritional disturbance,
Displacement of osteogenic function,
Irritations of hyperemia.

Weber[18] summarizes his study of osteoma of the dura by stating that ossifications of the dura belong not to the class of genuine tumors but to inflammations. The contiguity in deep sinus infection, with necrosis and dehiscence, would seem to afford an opportunity for metastasis. It would, of course, be equally possible for calcium metastasis to occur in various other parts of the body through the circulation.

This calcification might be a true hyperplasia, proliferative rather than degenerative in origin, or, as suggested by Zanda, quoted by Ewing,[19] these multiple nodules of bone found in cerebral and spinal arachnoida form about small vessels through degeneration, exfoliation and sclerosis of the endothelial cells and connective tissue forming in order, hyalin, osteoid and finally bone tissue.

Pertinent to our inquiry is the belief that at times the dura takes on an osteogenetic function in the presence of congestion (Thiroloix and Du Pasquier[20]); that microbic agents may play a part in certain varieties of calcification of the meninges, as typhoid bacilli and meningococci have been demonstrated in the bone plaques (Lutembacher[21]); that the frequent finding of milky exudates, areas of softening, hemorrhagic areas, etc., in the ventricles in association with calcification indicate the probability that the calcified areas are only coincidental changes with the exception of bone formation and calcification in tumors that produce bone (McKendree-Imboden[12]); that all instances of calcareous infiltration in the body must be regarded as retrogressive change—no new tissue formed—old tissue petrified (Hektoen and Riesman[22]); that deposits of calcium salts never occur in living tissue cells but in the inert interstitial matter between the cells—that is, in dead or dying material (Adami and McCrae[23]).

It is the belief of the writer with others that these osteitis changes are thrown out as a defense in deep perisinus areas, and the difficult point is to establish any link of continuity between this process in the surrounding bone tissue and the calcification process in the meningeal structure itself. Virchow's

calcification metastases, as suggested by Nonokawa,[24] include local disturbances of bone which cause the freeing of calcium salts which are deposited elsewhere, notably endocardium, dura, stomach and intestines. This again is favorable to our argument for connection.

Logan Turner and Reynolds[25] have studied in twenty autopsies the paths of infection to the brain after primary involvement of frontal, ethmoid or sphenoid sinuses, five, six and nine cases, respectively. They went so far as to demonstrate in one case of direct extension by microscopic necrosis, a constructed continuity of lymph vascular connections between the two layers of cranial bone, with processes of the deep layer of the mucosa passing into the bone. They demonstrated the following paths:

1. Through necrosing osteomyelitis.
2. Through thrombophlebitis of perforating veins.
3. Through Haversian spaces in sinus walls.
4. Along perineural lymph sheaths of olfactory filament.

There is not, however, any indication of the building of new bone structure in their studies, and the answer perhaps would be that in such a rapid process nature could find no time to emulate the slow defensive program in a typical osteitis or calcification.

Perhaps the most fascinating side of any rhinopharyngeal study lies in opportunity of completely analyzing an individual case. This should include the aid of nasopharyngoscope, lipiodol investigations, X-ray examinations and allergic studies. Perhaps this paper may further stimulate the watch for intracranial calcification, which we will still continue to call only coincidence. Calcification changes and pathology frequently occur together, but we do not always pick them up, to use the radio parlance.

At present the writer has six cases under observation; all of these presented striking phases of neuralgic pain complex. Each of these cases presented intranasal pathology of a degree justifying surgery—distortions of the septum, hyperplastic turbinates, disturbing synechia or sinus pathology, etc. Of these six, four presented calcification at the base of the brain around the pituitary area—two higher, about the longitudinal sinus.

In five of these cases up to date it has been absolutely im-

possible to obtain surgical cooperation; the sixth was operated upon in December last at the University Hospital, and happily this patient, who was referred by Dr. Wolferth, presents the most striking of my films. The citation of these six cases is undoubtedly evidence of what has happened in the practice of every rhinolaryngologist. Many times this number have either been noted or passed in examination; more conclusive X-ray study will bring them to light, and if they be of diagnostic value we shall observe them more carefully. The nasal pathology is sufficiently evident, even to the patient—and would be surgically corrected in mere routine.

In presenting the special case for discussion, I should prefer to do so in simple narrative review rather than in conventional case report. The intranasal procedures, clinical records and laboratory studies present nothing unusual and would be tedious. There is one point worthy of notice: each operative procedure was attended by intense reaction, reminding one of the so-called "neuro-recidiv" reaction. This exacerbation of nervous symptoms is very similar to that so often noted when by accident tonsil, turbinate or septum operation is undertaken in an unusually active septic condition.

This patient, Mrs. M., was referred by Dr. C. C. Wolferth of Philadelphia, for study of conditions underlying an unusual case of atypical neuralgia which she attributed to a sequence of nervous breakdowns some five years ago. She suffered from headaches, much worse at the time of menstrual period, nervousness, insomnia, lack of strength and vigor for social life, of which she was very fond. For this rather constant type of frontal headache she was carefully studied by internists of note. She had chronic constipation and supposed colitis, and the gall bladder was drained, the last time one and one-half years ago. At the menstrual periods she was subject to facial rash and furuncles.

The temporary relief resulting from stomach and intestinal treatment probably merely temporarily allayed the cranial congestion. She reports having sometimes freedom from headaches for two or three weeks—this, of course, makes the present five months' freedom from pain suggestive but not entirely conclusive. I am not aware that any intensive nose and accessory sinus examination had been made prior to December last.

At the time of the writer's examination report was made to Dr. Wolferth as follows:

"Mrs. M. brings a history of constant intermittent headache, worse in the last five years. Briefly, my study shows the following:

She has a very badly, and quite irregularly, deflected septum which ought to contribute to discomfort, much as packing of a nose would. Strangely, with this there is not particular evidence of turbinal change or of doubtful secretion. Postnasal and laryngeal areas I think may be eliminated. Tonsils have been well removed and tympanic membranes are not involved.

Now the X-ray brings a rather startling report, of which I give you a copy. From my standpoint, I think the septum should be corrected and the left ethmoid area exenterated. With this history, whether that will have any modification upon this calcified meningeal area or not, I am unable to tell; nor what etiologic relationship it has had, but on general principles she needs that help. I am inclined to think that Dr. Pendergrass will suggest something else (treatment by encephalogram)."

The preliminary X-ray studies by Dr. Pancoast gave the following report:

"Frontal, negative; ethmoid, slight clouding of some of the cells on the left side; maxillary, hazy on right side, suggesting some thickening of mucous membrane lining; sphenoid negative. There is calcification of the meninges in the frontal bone. The nasal chambers are completely filled by swollen or hypertrophied turbinates. The nasal chamber is slightly deviated toward the right."

And shortly after the operative work a subsequent one: "Frontal, clouding of left side; ethmoid, dense clouding of left side; maxillary, clouding of left side. All of these appearances have increased since the last examination. Nothing abnormal can be noted in regard to the orbits. The bilateral calcification in the frontal region is still present. The mastoid cells on the left side show some evidence of sclerosis, probably due to an old chronic mastoiditis."

It was decided to operate in two stages—first, on the septum, principally to gain room, later on the left ethmoid area. This was complete exenteration of the anterior and posterior eth-

moid cells, enlarging the outlet of the nasofrontal duct and opening of the sphenoid. Each operation was attended by marked reaction—not particularly febrile, but acute increase of cephalic pains. In the course of convalescence the left antrum became involved, requiring window resection, removal of the tip of the inferior turbinate and drainage washing. Today this patient is a happy, well woman, attending various social activities and buoyantly optimistic. The severe and customary neuralgia has practically subsided.

This is the story—certainly of interest and perhaps of value.

CONCLUSIONS.

1. Review of the literature fails to yield much consensus of opinion as to this condition, though research study in etiology has not been extensive enough to discourage further work.

2. It is quite reasonable to deduce the fact from the material presented, that calcification in certain areas, such as chronic low grade irritation in deep sinus infection, is a defense reaction and that where calcium salts are available in concentrated form in local tissue fluids, calcification is a sequence to normal fibrosis.

3. Though obviously relieved in the case reported, by intranasal surgery, the reasons for such relief are not quite clear.

4. Calcification of the meninges does not have a very clear etiologic relation to nasal pathology.

5. Operative procedures on focal pathology for the relief of atypical neuralgia in this area would still seem justified.

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XXVII.

BRAIN ABSCESS AND MENINGITIS SECONDARY TO ACUTE PARANASAL SINUSITIS.*

By John B. Potts, M. D.,†

Omaha.

Owing to the location of the paranasal sinuses and the thinness of their walls, it is to be expected that there will be direct extension of infection to neighborhood organs and structures. The most dangerous of these to the life of the patient is extension into the cranial cavity, resulting in meningitis or brain abscess. The orbit is most frequently involved. The picture presented in such a case frequently closely simulates cavernous sinus thrombosis. There is the prostration and fever, the latter frequently being 103 to 104; the eyelids are swollen in all degrees, from only slight redness to complete closure of the lids. Exophthalmos may be present. The excursion of the eyes is limited or fixed. The sight is present.

The condition is differentiated from cavernous sinus thrombosis by a history of the condition following an acute sinus infection; absence of any external lesion: evidence of infection in the nose—e. g., swollen turbinates, purulent secretion, radiographs (although the latter may show but little shading); relatively little true exophthalmos and normal or near normal vision. As the blood supply to the eye is not affected, the fundus shows but little change. On the contrary, in cavernous sinus thrombosis the circulation is obstructed and choked disc and hemorrhages result. This is not necessarily true in all cases of cavernous sinus thrombosis, as those which involve the posterior part first may never show the typical symptoms of those beginning in the anterior portion. Eagleton reports cases of this type.

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In pseudocavernous sinus thrombosis the orbital swelling is due to a cellulitis as a direct extension from some nasal sinus and may frequently involve only one eye; if bilateral, the swelling of the two eyes usually occurs at nearly the same time. While in cavernous sinus thrombosis the swelling begins in one eye, and practically always as the infection extends the other eye is equally affected.

The degree of swelling in pseudocavernous thrombosis or orbital cellulitis may vary from a very slight edema to the most severe type.

The spinal fluid is normal unless there is some extension intracranially.

The general condition in the two diseases often shows a striking difference, for in the pseudotype, as long as there is no extension into the cranium the patient usually is not seriously prostrated, while quite the reverse is true of cavernous sinus thrombosis by the time the ocular symptoms appear.

EVIDENCE OF INTRACRANIAL INVASION.

Just as the tissues of any other portion of the body may swell and show evidence of contiguous infection, so may the meninges show evidence of irritation or inflammation before actual invasion by bacterial organisms. Therefore patients frequently show premonitory symptoms of meningeal infection—usually severe headache, photophobia and some rigidity of the neck.

The actual intracranial invasion may be first evidenced by a little chill or a sharp rise in temperature. A convulsion is almost conclusive evidence of intracranial infection. I shall not give the symptoms of basilar meningitis, but will dwell a little on frontal lobe abscess, one of the most elusive and difficult to diagnose of brain abscesses. Situated in a silent area, there are often no localizing signs. Neurologic examination is usually negative. The eyes seldom show any muscle disturbance or choked disc. The location of the cortical centers for different portions of the visual fields has been carefully worked out by Rönne, Wollard, Brouwer and others. Pressure in the region of these areas from the abscess causes characteristic changes in the visual fields. Headache is present at some time. After the nasal condition is corrected they remain weak and

listless. The mental reaction is poor and there is loss of the usual interest in life; ratiocination is poor. The pulse is generally slow, spinal fluid pressure increased and may show some increased cells. In one case, previously reported, brought into the hospital in coma, the only symptoms were a persistent severe pain over the right frontal region, which came on after a cold, and a pulse of 44; all physical signs negative. An exploratory operation revealed a large abscess in the right frontal lobe.

CASE REPORTS.

Case No. 1.—Mr. F., age 37, brought into the Lord Lister Hospital in an ambulance on July 12, 1927, at noon. History: Two days ago went swimming in popular tank. That night developed severe headache, which has continued. Pain most severe in frontal region. At the time of the examination was in a semidelirious condition. General examination negative. Neurologic examination shows possibly slight rigidity of neck. Temperature 100, pulse 96, respiration 18. (Dr. A. Sachs.) The following twenty-four hours his condition continued much the same except that he had three convulsions. The head turned to the left and upward, and there was twitching of the left arm. There was some edema of the upper eyelids, the left more extensive. General and neurologic examinations the same. Temperature 100 to 101.6, pulse from 96 to 130. Nasal and buccal mucous membrane acutely inflamed. Both nares—turbinates tumefied, scanty grayish secretion over middle turbinates; septum deflected to the right. Ophthalmoscopical: Right nerve slightly blurred. White blood count 24,000; polys 84 per cent; spinal fluid, slightly cloudy, pressure increased, cells 102, polys 60 per cent, lymph 40 per cent; few extracellular gram positive diplococci. Radiograph: Right frontal and right ethmoids and left maxillary sinuses shaded. On the third day he had an intranasal drainage from the ethmoids, frontals, sphenoids and left antrum. The sinuses of the right side contained very little pus, those on the left were filled with pus. Following this he gradually improved, but the right upper eyelid became more edematous, and the drainage of that side of the nose was obstructed by the deviated septum and swollen middle turbinate. No convulsions after the first twenty-four hours, but he was

very drowsy, slightly cyanosed at times and continued irrational.

Two weeks after the first operation the right middle turbinate was removed and the opening into the right frontal sinus enlarged. No pus could be seen at this time. His general condition improved more rapidly following this and the edema of the eyelid subsided. He became rational and was able to read a newspaper. The neurologic examination was negative all the time for evidence of intracranial involvement. However, his improvement was much too slow, and it was felt that he must have some localized intracranial infection. On August 19th, about one month after the second operation, the right frontal sinus was opened externally. The inner table was necrotic and an epidural abscess was found beneath it. At the time and for some time preceding the operation his temperature was normal to 99, and his pulse rate range from 76 to 84. Following this operation he developed an osteomyelitis of the frontal bone, which was drained, and the sequestra removed as they became entirely free. He left the hospital September 3, 1927, but was not able to go back to work for several months. He then seemed entirely well until October, 1928, fifteen months after his sickness began, when while in Atlantic City on a combined business and pleasure trip he suddenly became violently ill, apparently with some intracranial condition. He was taken to Philadelphia and operated on by an eminent physician there. At autopsy no abscess or other intracranial condition was found to account for his death.

Case No. 2.—Mrs. M. D., age 23, brought into the University Hospital August 7, 1927, with the following history: She slept in a draft two nights ago and caught cold. The following morning she had a severe frontal headache, which grew worse and the left eye became swollen. The next day the right eye began to swell. Examination: Now complains of severe frontal headache. Mentally alert. Temperature 100. Both eyes swollen—the swelling of the right was moderate and could be opened; the left was extremely swollen with ecchymosis and could not be opened. Ophthalmoscopic examination: Right eye, vision 20/30, disc slightly choked; left eye, vision and condition of fundus could not be determined. Nose: Middle tubinates both inflamed and swollen; pus in both nares,

apparently from ethmoid region. Radiograph: Ethmoids all cloudy; other sinuses fairly clear. White blood count 12,400, polys 95 per cent, blood culture negative.

The ethmoids were exenterated and found to be soft and filled with a thick yellow pus. The following day her temperature rose to 104 and she had a chill. On the third day the orbit was incised and some pus evacuated. Blood culture positive for staphylococcus. Culture from nose the same. The temperature range for the first seven days was from 101 to 104, then it gradually dropped. On the eleventh day an abscess of the left breast was drained, and on the thirteenth day one in the hip. The next week the left frontal region became swollen and soft. This was opened and an area of osteomyelitis was found. This extended and required further drainage. She improved slowly and in about eight weeks the temperature became normal. During the next month she improved very slowly and had occasional dizzy spells with vomiting. On November 24th, more than three months after she came into the hospital, she rather suddenly became worse and showed definite evidence of brain abscess—headache, vomiting, and for the first time a slow pulse of 60. Neurologic examination: Reflexes exaggerated; abdominal reflexes, right sluggish. Ankle clonus, right, positive. Ophthalmoscopic: Four diopters of choked disc, bilateral. The left frontal lobe was explored and an abscess found at a depth of 3 cm. After this she gradually recovered and left the hospital at the end of six months, apparently well. In the spring of 1928 she developed epileptiform attacks and came into the hospital June 26th. The old incision was opened and a small amount of necrotic tissue and pus was evacuated. The epileptiform attacks ceased and she left, apparently in good condition. The latter part of September she began to have severe pain in the left leg, and on October 15th, while on the way to the hospital she became unconscious, and was carried into the hospital on a stretcher. The left frontal lobe was again explored and an abscess found about 5 cm. from the anterior surface. On account of the depth of the abscess, a counter-opening was made in the temple and through and through drainage established. The drainage was never satisfactory, and on the first of December the frontal bone was removed from the old incision just above the eye-

brow down to the ethmoids. The abscess was drained from this low level along the floor of the cranium. The patient made an uneventful recovery and is still apparently well.

Case No. 3.—L. A., boy, age 9 years. Brought into University Hospital December 16, 1928, on a stretcher. History: Five days ago (December 11th), following an acute head infection, the right eye became swollen. The family physician applied ice to the eye. On the third day he was taken to an oculist and rhinologist, who found pus in the right naris and treated him by shrinking the middle turbinate and aspiration. The condition grew worse and he was sent into the hospital with a diagnosis of cavernous sinus thrombosis. Examination: Right eye extremely swollen with ecchymosis, left eye a little swollen. Delirious with frank signs of meningitis. Temperature 106. White blood count 15,400, polys 88 per cent. Spinal fluid cloudy, contains gram negative diplococci. Ophthalmoscopic examination: Fundus normal in both eyes. Nose: Right naris filled with pus and blood. He died the following morning. Autopsy report: Purulent meningitis. No cavernous sinus thrombosis.

CONCLUSIONS.

Acute infections of the paranasal sinuses showing evidence of extension into the neighboring organs require prompt and surgical drainage.

If drainage is established early and further infection from the sinus stopped, a beginning meningitis may be localized by nature.

If free drainage is not established, intracranial infection is usually fatal.

Early symptoms and signs must not be disregarded; severe headache, evidence of meningeal irritation, orbital cellulitis are the most common.

In case No. 1, the convulsion probably followed the initial invasion of the meninges, and in case 2, the chill indicated the beginning of a brain abscess.

XXVIII.

TRIGEMINAL DISTURBANCES OF OTITIC ORIGIN.*

By French K. Hansel, M. D.,†

St. Louis.

The transmission of pain impulses from the sphenopalatine region to the ear has for many years engaged the attention of otolaryngologists. Great interest has likewise been shown in the study of reflex pains in the ear which originate not only in the sphenopalatine area and other parts of the trigeminal distribution, but those which originate in the domains of other cranial nerves which contribute to the nerve supply of the middle ear and mastoid, such as the facial, glossopharyngeal and vagus nerves.

The occurrence of reflex pain, transmitted in a reverse manner—that is, from the middle ear and mastoid to the trigeminal, trigeminal-facial, glossopharyngeal and vagus endings, while not infrequently observed in acute otitis media and acute mastoiditis, is rarely observed in chronic otitis media and chronic mastoiditis.

The following cases in which pain was referred to the second and third divisions of the trigeminal nerve as the result of chronic otitis media and chronic mastoiditis are interesting, not only on account of their rarity, but they bring up for consideration the probable pathways of pain transmission from the middle ear and mastoid to the trigeminal areas.

Case 1.—F. S., a man, aged 22 years, gave a history of having had an acute upper respiratory infection complicated by bilateral otitis media six months previous to coming under my observation. The otitis media in the right ear cleared up within a period of five weeks, but the left ear continued to discharge. At the onset there was no severe pain or swelling over the left

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mastoid. Two months later, however, a slight swelling or thickening of the tissues over the left mastoid and tenderness upon pressure became apparent. For a period of about a month previous to his coming under my observation, the patient had had attacks of pain in the teeth of the left upper jaw. There was a more or less constant aching, referred especially to the molar teeth. At times there were attacks of sharp lancinating pains which lasted only for a few minutes. For three months he also had attacks of dizziness which at times became so marked that he was unable to walk. There was a tendency to fall to the left. There was no history of generalized headache and visual disturbances. Patient lost sixteen pounds in weight.

The examination of the left ear showed the left canal filled with foul-smelling pus. Upon removal, a small posterior perforation was noted, through which the pus was discharging. The examination of the mastoid showed tenderness on pressure, especially over the tip. There was a marked thickening of the soft tissues and also some thickening of the bone. There was a marked reduction of hearing in the left ear, a deafness of the middle ear type. The Weber was referred to the left and bone conduction was markedly increased on this side. Examination of the right ear drum showed it to be within normal limits. The nose showed a slight general atrophy of the membrane throughout, otherwise negative. Tonsils were moderate size and septic in appearance. The general and neurologic examinations were negative. X-rays of the left mastoid showed a large, clearly outlined oval shaped cavity occupying almost the entire mastoid, extending from the region of the mastoid antrum to the tip. A diagnosis of chronic mastoiditis of the coalescent type, complicated by reflex pains in the second division of the fifth nerve, was made. A mastoidectomy was advised and performed a few days later. At operation the subcutaneous tissue and periosteum were found to be very much thickened. The cortex was very thick. The mastoid cells were broken down into one large cavity extending from the region of Trautman's triangle down to the tip. The cavity was filled with foul-smelling pus and was lined with a very thick pyogenic membrane. The lateral sinus was not uncovered. The cavity communicated with the aditus and antrum. The cavity was thoroughly cleaned out and the edges beveled to lessen

deformity. One vaseline pack was inserted and the wound sutured with silkworm gut.

Five days after operation, upon removal of the pack from the mastoid wound, an attack of severe pain was excited in the second division of the left trigeminal nerve, the pain being referred mostly to the teeth. After this attack had subsided, there was no further recurrence of pain. The mastoid was completely healed and the middle ear was dry within a period of three weeks. The hearing was much improved and within five weeks after the operation it had returned almost to normal.

Case 2.—Miss R. M., a woman, aged 21 years, was seen for the first time on August 4, 1927, complaining of mild attacks of dizziness with pain in the left temporal and occipital regions. The patient had had acute otitis media in the left ear two and one-half years previously, which was complicated by acute mastoiditis. The ear continued to discharge, and six months later a simple or complete mastoid operation was performed. The postoperative course was uneventful, except for a small fistula in the wound in the region of Trautman's triangle. The fistula would open and discharge for a few days, close for a period of several weeks and then open and discharge again. About a year after the operation the patient began to have mild attacks of dizziness and pain in the temporal and occipital regions. At the time of my first examination there was no discharge from the left ear, but the old mastoid scar, which was very much depressed, had a small crust in the region of Trautman's triangle. The crust was removed and a small mass of granulation tissue was noted but there was no discharge of significance. The patient was kept under observation for a period of about four months, at which time a foul-smelling discharge appeared in the left ear. This was thoroughly cleaned out but no perforation was observed in the drum. After daily treatment for about two weeks there was no further discharge in the canal.

About four weeks later the patient returned with marked edema over the right mastoid and a foul-smelling discharge from the left canal. After thoroughly removing this, a small area of granulation tissue was noted along the upper posterior wall, but no perforation of the drum could be found. The patient stated that for several days she had been having frequent

attacks of pain in the upper and lower jaws. The teeth seemed very sensitive, and in the side of the face sensations of numbness and tingling were apparent.

On the basis of the edema over the mastoid and the discharge from the canal, I decided to explore the mastoid. The old scar was excised along with a fistulous track extending downwards below the area of granulation tissue previously noted. The soft tissues and periosteum were edematous, and in the region of Trautman's triangle a mass of infected granulation tissue and a few small pieces of necrotic bone were found. The remaining portion was sclerotic and no cells were found. During the operation a small area of dura, about one-half cm. in diameter, was uncovered over the temporal lobe but this appeared to be normal.

The postoperative course was uneventful and the right mastoid was healed within two weeks. There was no return of the attacks of pain in the upper and lower jaws following the operation, and during a period of nine months since then there has been no return of symptoms.

Case 3.—Mrs. H. G., woman, aged 26, was first seen September 17, 1927, on account of a discharge from the right ear and tenderness over the right mastoid which had been present for about two months. The patient stated that the right ear had been discharging since an attack of an acute otitis media fourteen years previously. On several occasions she had had an acute exacerbation of the chronic infection, in which attacks there was tenderness over the mastoid, which always subsided within a few weeks. The ear had been treated by a number of otologists but had never become completely dry. There was no headache, dizziness or pain other than the tenderness over the mastoid.

Examination of the nose, tonsils, nasopharynx, pharynx and larynx was grossly negative. The left ear drum was moderately retracted. The right ear showed the canal filled with a foul-smelling, yellowish secretion. The canal wall was somewhat swollen and injected. There was a large posterior perforation and some granulation tissue in the middle ear. The skin over the mastoid was extremely hypersensitive to touch even when no pressure was exerted. The hearing was mark-

edly reduced, the deafness being of the conduction type. X-rays of the mastoids showed on the right side a complete sclerosis, no cells being present and no apparent destruction of the mastoid. On the left side a few small cells were visible. It was evident that this patient had a chronic otitis media and chronic mastoiditis, but it seemed advisable to clean up some of the infection by treatment before resorting to the radical operation.

Local treatment consisted of the installation of hydrogen peroxid and cleaning out the canal and middle ear, followed by the installation of a few drops of phenol and glycerin. No alcohol was used.

After the ear had been treated two or three times the patient began to complain of severe pain in the ear, radiating to the upper and lower jaws. The teeth were very sensitive, and at times the attacks of pain were as severe as paroxysmal trigeminal neuralgia. Pain was continuous, almost day and night, the patient being unable to eat or sleep. Any manipulation, such as wiping in the canal of middle ear would produce a paroxysm of pain in the jaws, referred mostly to the teeth. These attacks of pain continued for about ten days, and it was impossible to relieve them by any form of local treatment.

At this time an immediate radical operation was advised. The patient, however, consulted another otologist, and he performed the radical operation on October 8, 1927. A report from him stated that at operation the mastoid was found to be very sclerotic, only a few cells being present in the region of the antrum. These were found to be infected and full of pus. These cells were completely removed and the middle ear cleaned by the usual radical method. The radical cavity healed uneventfully, the patient became free of all pain and has up until the present time had no further trouble.

In these three cases of chronic mastoiditis the characteristic features were the attacks of severe pain and paresthesia in the second and third divisions of the trigeminal nerve on the affected side. All of the patients were completely relieved of pain following the removal of the diseased process from the mastoid. In one case the pain syndrome came on only after local treatment of the canal and middle ear was instituted. There is every reason to believe that the pain in the trigeminal

areas was of a reflex nature and that the stimulus originated in the middle ear and mastoid.

In the review of the literature on this subject, it is surprising to note that only a few cases of a similar nature have been reported.

In a most comprehensive report on this subject, Uffenorde,[1] in 1926, reported two cases in detail and referred to several others which he collected from the literature. His first case was a male, aged 37, who had a chronic middle ear suppuration on the right side, of two years' duration. The patient had consulted several otologists during a period of two weeks on account of severe attacks of pain in the ear and in the second and third divisions of the trigeminal nerve, without relief. A dentist had opened one tooth and extracted another. The ear was cleaned out with peroxid. The patient immediately complained of excruciating pain in the lower jaw and teeth and a sense of numbness and tingling in the face along the lower jaw. During the attack of pain the patient held his hand pressed against the right side of his face just like a patient with paroxysmal trigeminal neuralgia. The pain would come on in attacks mostly during the evening and night, accompanied by paresthesia in the maxillary and mandibular regions. The teeth had the sensation of being thick and elongated, first one tooth and then the other seemed to be involved. He also had spasms of the muscles of mastication, so that he could hardly open his mouth to eat. Pulsating noises were noted in the right ear. There was no dizziness or other symptoms.

The examination of the right ear showed the canal filled with mucopurulent secretion. The inner portion of the canal was narrowed by the presence of granulation tissue, and on this account no further details could be made out. A moderate degree of deafness of the middle ear type was present.

A radical operation was performed on the mastoid. The antrum was filled with cholesteatome. Most of the ear drum and the ossicles were absent. The lateral sinus and dura of the middle fossa were normal. In the tympanic cavity, lying behind the granulation tissue in the narrowed canal, two small cotton tampons were found pressing on the promontory. Cultures of the pus showed pneumococci, streptococci and proteus bacillus.

Following the operation the pains in the ear and jaws disappeared within a few days, but two weeks after the operation the pain syndrome was reproduced by the installation of resorcin alcohol into the radical cavity. The radical cavity healed within three months and the patient was entirely free of pain.

The second case was a man, aged 28, who complained of having had a discharge from the left ear for three and one-half weeks. The otitis media began suddenly with severe pain and dizziness which disappeared when the ear began to discharge freely. The patient complained of pulsating noises in the left ear and pain radiating into the left frontal region. There were also lancinating pains in the teeth of the left lower jaw and into the neck and shoulder. Examination of the left ear showed a small amount of odorless mucopurulent discharge in the canal and a small posterior perforation in the drum. A moderate degree of deafness of the middle ear type was present. X-ray of the mastoids showed a diffuse cloudiness of the cells on the left side, in contrast to the clear cells on the right side. On both sides the cells were small and of the diploic type. For the next few days the patient continued to complain of the pain and slight sensitiveness to pressure was apparent over the mastoid process.

Twelve days after the onset of the otitis media a mastoid operation was performed on the left side. The mastoid cells were found to contain pus under pressure. There was a destruction of bone in the tip, over the sinus, in the angle cells and also behind the sinus. The dura of the posterior fossa was exposed over an area of 2 cm. in diameter and found to be covered with granulation tissue. Cultures of the pus showed streptococcus mucosus.

A few days after the operation the patient developed cerebellar symptoms. The mastoid was reopened and the cerebellum explored, but found to be negative. Finally these symptoms subsided, the mastoid healed and the patient became free of all pain.

About two years ago, Wieder[2] reported a case of tic douloureux cured by mastoidectomy, before the Philadelphia Laryngological Society. This patient was a woman, aged 38, who twelve years previously had suffered with an attack of otitis

media in the right ear. Following this attack there was no further discharge from the ear, but the patient complained of tenderness over the right mastoid, to such an extent that she was unable to lie on her right side or to wear tight fitting hats or use the telephone with her right ear.

Five years later, after exposure to cold, she developed pain in the right side of her face which began in the lower jaw. It was always present on damp days, and a sharp wind precipitated a violent attack. Two years later she consulted an oral surgeon, who removed the nerves from the right lower incisors but the teeth remained sensitive. Later the mandibular nerve was injected with alcohol. After leaving the lower jaw the pain appeared in the cheek and in the supraorbital region, accompanied by drooping of the right upper lid and a sense of stiffness in the right side of the face. She was advised to have a gasserian ganglion operation but this was not done.

Later she had two attacks of acute otitis media which subsided. Finally, on account of the tenderness over the mastoid and the tendency to facial neuralgia, a mastoid operation was decided upon. X-rays of the infected mastoid showed a definite area of absorption over the lateral sinus at the site of the local tenderness. The other mastoid did not show such an area. At operation the area which appeared to be an area of absorption in the X-ray, proved to be a large space without contents, lined with epithelium overlying and behind the lateral sinus. No other definite pathology was found. Following the operation the patient was relieved of all symptoms, and three years later there had been no return.

Disturbances in the trigeminal areas of otitic origin have been frequently noted in association with the gradenigo syndrome, but in this instance there is a direct irritation of the gasserian ganglion. Trigeminal disturbances have also been noted in herpes zoster oticus, but it is difficult to determine whether there is involvement of the gasserian ganglion as well as the geniculate ganglion, or whether the trigeminal disturbance is a reflex from the involvement of the geniculate ganglion alone. Multiple ganglionic involvement, however, has been recognized in herpes zoster oticus.

When we consider, therefore, the probable pathways for the transmission of pain impulses from the middle ear and mas-

toid, the anatomic and embryologic evidence points to the geniculate ganglion of the facial nerve as the most important factor. The innervation of the middle ear and mastoid is also derived from the trigeminal, glossopharyngeal and vagus. In order to obtain a clear understanding of this problem it is necessary to consider first the various anastomoses of the facial nerve with the other cranial nerves contributing to the nerve supply of the middle ear and mastoid.

It is known that anastomoses exist between the facial nerve and the vagus, glossopharyngeal and trigeminal nerves, and it is probable that stimuli originating in the domain of these nerves in the middle ear and mastoid are transmitted mostly to the sensory portion of the facial. The connections of the facial with the sphenopalatine portion of the trigeminal, therefore, serve as the pathways for the transmission of pain impulses from the middle ear and mastoid to the second and probably the third divisions of the trigeminal nerve.

In a recent comprehensive study of the embryology and neurohistology of the sphenopalatine ganglion connections and a further study of the mechanism of pain transmission in certain types of otalgia, Larsell and Fenton[3,4] definitely established the sensory connections between the sphenopalatine ganglion and the auricular region.

Accepting the sphenopalatine ganglion as a sympathetic ganglion with characteristic multipolar cells, they pointed out its origin in comparative anatomy along the course of the palatine branch of the primitive seventh nerve. They also emphasized the fact that lower forms show numerous physiologically different sets of nerve fibers, readily traceable by size, myelin, sheathing, etc., in the seventh, ninth and tenth cranial nerve trunks, and to a lesser degree in the fifth. Thus the fifth and seventh are much alike in lower vertebrates, while in the mammals reapportionment of function leaves the fifth largely sensory and the seventh largely motor.

In order to understand more clearly these various nerve connections, it may be well to quote the following comments of Larsell and Fenton.[3]

"The sphenopalatine ganglion has its embryologic origin in mammals by migration of cells from the V and VII ganglia

(Kuntz). It is connected, however, in the adult, not only with the maxillary branch of the trigeminus nerve through the sphenopalatine nerves, and with the facialis through the intermediation of the Vidian nerve and the great superficial petrosal nerve, but also with the glossopharyngeus nerve through the great deep petrosal and its continuations, the small deep petrosal and the nerve of Jacobson (Fig. 1). It is possible that there are also connections with the vagus, through the communicating branches between the nodose ganglion of the latter nerve and the glossopharyngeus nerve.

"An understanding of the intricate relations of this centrally located ganglion, with its many connections, must be based upon a knowledge of the comparative anatomy of the region and nerves involved.

"In the sharks (Fig. 2) both the facialis and the glossopharyngeus nerves give off a rostrally directed palatine branch. These two rami supply, in general, the same region, and the branches illustrate the fundamental pattern of the cranial nerves as it is conceived by morphologists. No sphenopalatine ganglion as such is present in the sharks. The ramus palatinus VII is derived from the geniculate ganglion, as shown in the figure.

"In the amniotes (Fig. 3), conditions are somewhat modified. A ganglion has appeared along the course of the palatine VII nerve, and the palatine IX nerve has disappeared as a distinct branch. The IX nerve is still connected with the VII nerve through the communicating branch of Jacobson; and in the amniotes we also find a connection, apparently not present in the fishes, in a branch between the ganglion nodosum X and the petrous ganglion of the glossopharyngeal nerve."

Although they point out that the sphenopolatine ganglion cells, sympathetic in character, receive small preganglionic fibers through the great superficial petrosal, numerous large medullated fibers of the sensory type which run through the sphenopalatine and great superficial petrosal to reach cells in the geniculate ganglion were demonstrated, these sensory fibers come from palatal and nasal distribution.

Confirming Ramsay Hunt's[5,6,7] clinical studies and Rhinehart's[8] work on the mouse, Fenton and Larsell have found in the human fetus a small facial branch distributed through the

auricular branch of the vagus to the posterior part of the auditory meatus and tympanic membrane, and to the cranial surface of the auricle and skin over the mastoid. Its fibers arise from cells in the geniculate ganglion.

The great superficial petrosal nerve may be considered a mixed trunk, consisting of a white ramus communicans plus the palatine seventh. The geniculate ganglion into which the cutaneous auricular branches of Rhinehart pass is a sensory ganglion containing unipolar cells of the usual craniospinal type. Large myelinated fibers from the palatine distribution were traced through the sphenopalatine ganglion without interruption into the great superficial petrosal nerve, and then to cells of the geniculate ganglion.

Fenton and Larsell thus established the condition needed elsewhere in the body for reference of pain from a visceral region to a body surface. Irritation in the sphenopalatine region stimulates the palatine seventh fibers through the great superficial petrosal to cells in the geniculate ganglion; these cells are directly related to contiguous cells from the fibers of the cutaneous branch of the facial, described by Rhinehart, and transfer the pain impulse to the auricular and mastoid region supplied by this nerve.

Further work being done by Fenton and Larsell on the deep petrosal sensory tracts, carotid plexus, vagus and glossopharyngeal connections may throw further light on this subject.

Observations on the cutaneous nerve supply of the membrana tympani and external canal made by J. Gordon Wilson,[10 11] showed that it is derived chiefly from the auriculotemporal branch of the fifth and to a less extent from the auricular branch of the vagus.

J. Ramsay Hunt devoted careful consideration to the cutaneous facial supply and made interesting clinical observations on possible cutaneous afferent nerves to the region around the ear, based on disease of the geniculate or herpes zoster oticus. It is difficult, however, to make this a basis for anatomic distribution because usually such lesions involve more than one adjacent ganglion. Such evidence, although very suggestive, is not conclusive, since it is difficult to be certain whether the geniculate ganglion is involved alone or whether the disturbance involves other adjacent ganglia as well.

In a recent report of twenty-five cases of glossopharyngeal neuralgia collected by the author,[12] attention was called to the fact that in several instances attacks of neuralgia could be excited, not only through a trigger area in the pharynx, but trigger areas were present on various parts of the auricle. Stimulation of these areas on the skin of the auricle excited paroxysms of the neuralgia, in spite of the fact that no areas of this region are apparently supplied by this nerve. It is safe to assume, therefore, that although the facial, trigeminal and vagus are considered the nerves supplying this region, certainly intimate anastomoses exist with the glossopharyngeal nerve.

In the final analysis of the nerve supply of the middle ear, mastoid and adjacent cutaneous area, it is apparent that there are intimate anastomoses between the various nerves involved to such an extent that they all form a nerve plexus. The facial is intimately associated with the trigeminal; also the vagus through the medium of the facial. The facial is connected with the trigeminal not only through the great superficial petrosal, but also through anastomoses with the auriculotemporal. The glossopharyngeal anastomoses with the vagus and the facial. The tympanic or Jacobson's nerve, through the small deep petrosal, is connected with the trigeminal by way of the great deep petrosal nerve. Jacobson's nerve also anastomoses with the facial. The small superficial petrosal derived from Jacobson's nerve connects with the otic ganglion. These nerve connections suggest the possibility of pain transmission to the second division of the trigeminal through the facial connections, and to the third division through the glossopharyngeal connections with the otic ganglion.

In conclusion, it may be said that several pathways exist for the transmission of pain impulses from the middle ear and mastoid to the trigeminal areas. It is highly probable that the facial plays the most important part, not only through its anastomoses with the glossopharyngeal and vagus, but through its own cutaneous branches. More direct connections between the glossopharyngeal and trigeminal through Jacobson's nerve and the small deep petrosal nerve by way of the great deep petrosal to the sphenopalatine and the small superficial petrosal with the otic ganglion are to be considered in the transmission

of impulses to both the second and third divisions of the trigeminal. The part played by the auriculotemporal nerve probably plays a less important part in this consideration.

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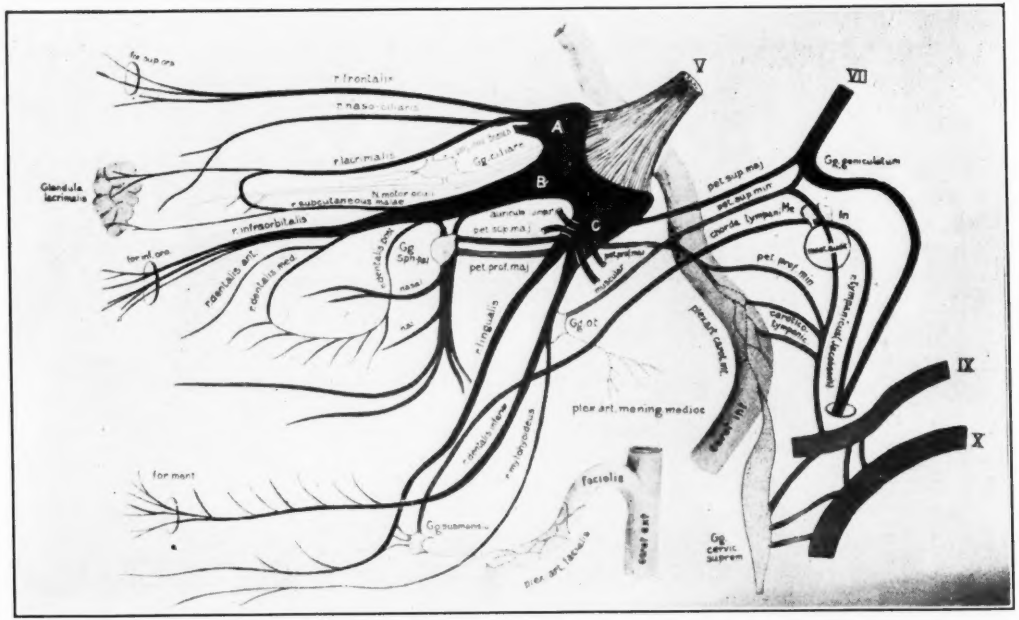

Fig. 1. Inter-relation of Trigeminus, Facialis, Glossopharyngeus, and Vagus, together with the sympathetic ganglia in man. Based upon diagrams by several anatomists (Arnold, Gray, Gegenbaur).

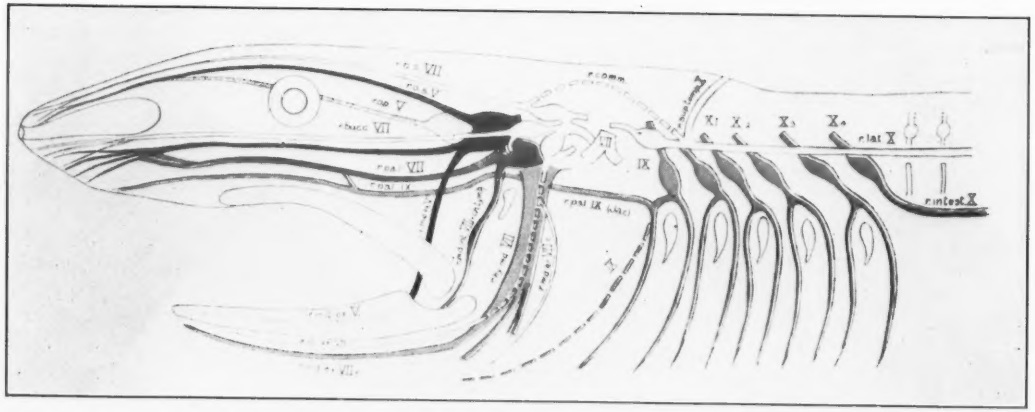

Fig. 2. Diagram of cranial nerves in Anamnia. [After Wiedersheim.] The eye muscle nerves are omitted. Roman numerals indicate the cranial nerves. Branches of these are designated as follows

r. o. s., ramus ophthalmicus superficialis; *r. o. p.*, ramus ophthalmicus profundus; *r. bucc.*, ramus buccalis; *r. pal.*, ramus palatinus; *r. md. ex.*, ramus mandibularis exterrus; *r. md. int.*, ramus mandibularis internus; *r. hy. md.*, ramus hyomandibularis; *r. comm.*, ramus communicans (in Dipnoi); *r. lat.*, ramus lateralis; *r. intes.*, ramus intestinalis.

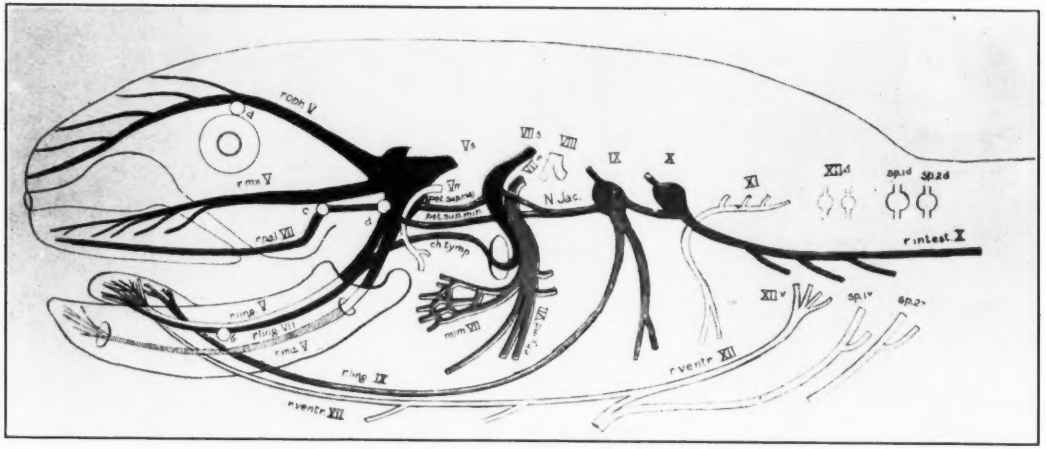

Fig. 3. Diagram of cranial nerves in Amniota. [After Wiedersheim.] The eye muscle nerves are omitted and there are a few other slight changes. Roman numerals indicate the cranial nerves.

sp. 1 and *sp. 2* are first and second spinal nerves respectively. Branches are designed as follows: *r. oph.*, ramus ophthalmicus; *r. mx.* ramus maxillaris; *r. pal.*, ramus palatinus; *ch. tymp.*, chorda tympani (ramus mandibularis internus); *r. ling.*, ramus lingualis; *r. md.*, ramus mandibularis; *mim.*, mimetic nerve; *r. hy. md.*, ramus hyomandibularis; *r. ventr.*, ramus ventralis; *pet. sup. maj.*, petrosus superficialis major; *pet. sup. min.*, petrosus superficialis minor; *n. Jac.*, Jacobson's nerves; *s.* and *m.* denote sensory and motor branches respectively; exponents *d* and *v* denote dorsal and ventral roots respectively; *a*, ciliary ganglion; *b*, sub-maxillary ganglion; *c* spheno-palatine ganglion; *d*, otic ganglion.

XXIX.

PERFORATION OF THE ESOPHAGUS WITH REPORT OF SIX CASES.*

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Perforations of the esophagus may be classified into those which occur in the cervical and those which occur in the thoracic region. They are caused as a rule by sharp foreign bodies which pierce the esophagus or through accidents while employing instruments in that area. Gunshot wounds and sharp pointed weapons have been known to perforate the esophagus.

Christie has reported a case of perforation by a simple ulcer. The patient, a man, aged 60, had symptoms of ruptured gastric ulcer. He was operated upon and no ulcer was found. He died a few hours later and autopsy revealed a simple ulcer of the esophagus which had perforated into the thoracic cavity about two inches above the diaphragm.

Miller has reported the case of a girl, age 10, who was seized during the night with sudden pain and vomiting. No history of foreign body could be obtained. The child died in forty-eight hours and postmortem showed a tear in the esophagus about 5 cm. above the cardiac end. Pyopneumothorax was found. The paper was published under the title "Unexplained Rupture of the Esophagus." Malignancy is not infrequently a cause of perforation, and Killian has reported a case in which the process extended to, and perforated, the aorta. Linn and Doria each reported a case in which perforation of the esophagus was followed by laceration of the aorta after the patients had swallowed sharp chicken bones. A case was reported by Equin in which a boy, age 4, had a spontaneous rupture of the esophagus in the post wall at about the level of the aorta. This boy had a lye stricture of two years' duration. Myerson recorded a case in which the symptoms of perforation of the

*Read before the Middle Section of the Triological Society, January 9, 1929, Chicago, Ill.

esophagus occurred in a lye stricture case four days after passing a bougie. He was not able to state whether the perforation was spontaneous or due to the instrument. It is probable that the esophageal wall above the site of the stricture gradually thins out as a result of constant dilatation, and rupture, at this point, seems possible.

Of the six cases I am presenting, four were produced by chicken bones. Frequently foreign bodies among adults are swallowed as a result of wearing false teeth, because the plate deprives the individual of the sensation in the teeth and soft palate which might detect the foreign body in the mouth.

None of these cases had false teeth. In two of them perforation occurred in the thoracic and four in the cervical region. There was one death.

Case No. 1.—R. D., age 6, was admitted to the Jewish Hospital, November, 1920, for lye stricture of the esophagus at the junction of the lower and middle third. Gastrostomy was necessary for feeding. Dilatation was carried out under direct vision until swallowing was sufficient to allow the gastrostomy to close. After this the dilatation was done by passing a metal bougie blindly. On July 5, 1921, after bouginage the child complained of pain in the upper abdomen. He was put to bed and an ice cap applied. In a few hours he was acutely ill. Temperature 105, pulse 150, W. C. 23,000. He was restless and still complaining of pain. X-ray, twenty-four hours later, showed uniform density of the right lung. His condition improved somewhat in the next few days. A clinical diagnosis of pneumonia was made by the pediatric service. His temperature ranged around 102, pulse 130, W. C. 20,000. The X-ray plates showed no change in the density of the right lung. He was supported by glucose and salt solution injected subcutaneously. Ten days after the onset an X-ray with barium showed no fistula between the esophagus and the thoracic cavity; liquid diet was given. His condition improved slightly for the next ten days. On the twenty-fourth day X-ray showed a diffuse general increase in the density of the right side of the chest, probably due to fluid. The clinicians agreed with this finding and a needle was inserted and pus obtained. The Surgical Service was consulted and advised draining of the pleura. Dr. Schriver resected a rib, opened the pleura and ob-

tained fourteen ounces of thin, greenish yellow pus. A tube was inserted and excellent drainage resulted. The child recovered gradually following this procedure. He is well now and has no difficulty in swallowing (seven years later). It is obvious that in this case the use of a bougie without a guide was the cause of the complication. Bouginage should not be attempted without a swallowed string as a guide.

Case No. 2.—Mrs. S. M., age 36. Her history revealed that eight days previously she had swallowed a chicken bone which stuck in the middle esophagus. She went to the family doctor a few hours later, and he passed a stomach tube in order to dislodge the bone. She felt very little better following this procedure and was able to take only fluids and gruel for the next eight days. At this time she called on the family physician again. Once more he passed a stomach tube and on withdrawing it the patient vomited a large quantity of blood. This vomiting of blood continued throughout the day, and I saw her about 7 p. m. at the hospital. The pulse was 150, temperature 100, W. C. 15,000 at this time. Esophagoscopic examination revealed a large amount of blood in the esophagus, and each time that suction was applied more blood was regurgitated from the stomach. Continuous suction enabled me to see a laceration about an inch large on the posterior wall of the lower third of the esophagus. No foreign body was seen and the X-rays were negative. There was not much bleeding from the wound. The patient was given large doses of morphin and supported with salt per rectum and under the skin. The pulse and temperature improved in the next few days, and at the end of a week she was given sterile liquids without untoward effects. She made a good recovery, leaving the hospital in about three weeks.

In commenting on this case the danger of blindly passing a tube or probe down onto a sharp foreign body is brought to our attention. Here was an injury to the thoracic esophagus which recovered without the formation of pus. It occurred to me that the size of the perforation may have played a part in the recovery because it provided drainage. Seifert has reported cases in which he did an internal esophagotomy by means of a scissors inserted through the esophagus. He believes that by internal opening ample drainage is obtained for perforations.

Case No. 3.—Mrs. G. Y., age 39. On July 27, 1927, the patient swallowed a chicken bone, which lodged in the upper esophagus. Her father, a physician, passed a stomach tube without relief. Three days later she consulted me, complaining of difficulty in swallowing and soreness in the neck. An esophagoscopy was done under general anesthesia because of tenderness. The postpharyngeal wall and the lumen of the esophagus were red and swollen. There was some exudate and hemorrhage present. The small Mosher scope was passed with difficulty. A small sharp bone about three-fourths of an inch in length, imbedded in the upper post wall of the esophagus was removed. Her temperature was 100, pulse 90, W. C. 10,000. Three days later she left the hospital with symptoms improved and a normal temperature. A few days afterwards she returned with chills and fever, complaining of difficulty in swallowing water, stiffness and soreness of the neck. Temperature 101, pulse 100, W. C. 12,500. There was swelling and tenderness of the right side of the neck behind and just above the thyroid. The laryngeal mirror revealed swelling of the postpharyngeal wall and edema of the right side of the larynx. Hot applications were made to the neck and the following morning the patient spit up some dark yellow pus. This drainage continued for three or four days, and the symptoms subsided gradually during the course of a week.

In this case evidence of perforation was delayed. The pus must have formed slowly. Fortunately it evacuated into the pharynx instead of going downward into the mediastinum.

Case No. 4.—C. B., age 58. On July 15, 1928, while eating chicken, a bone stuck in the throat. He had very much pain and difficulty in swallowing. A few hours later he called on his family doctor and insisted that he pass a stomach tube in order to dislodge the bone. Against his better judgment, the doctor did as he was requested. The following morning I saw the case and passed a small Mosher esophagoscope. There was much redness and swelling and some bleeding at the upper end. No foreign body was found. The patient was sent to the Jewish Hospital and ice applied to the neck. Swelling increased rapidly. The following morning the patient was unable to swallow water. Temperature 101, pulse 120, W. C. 28,000. No emphysema. Some swelling and tenderness in the neck. On the fourth

day the temperature and pulse came down and the patient was able to swallow liquids. His W. C. remained around 25,000, however. The ability to swallow improved gradually, and he was discharged on the sixth day. Here is an upper esophageal perforation in which there was potential danger, but on account of the early subsidence of the symptoms the policy of watchful waiting was advisable.

Case No. 5.—S. A., age 11 years. The history shows that while in school she was reprimanded by her teacher and told to stand in the corner. She cried and sniffled and put her handkerchief to her face. A thumb tack which she used on her drawing board was in the handkerchief and she swallowed it. The X-ray revealed the tack at about the level of the seventh cervical vertebra in the upper end of the esophagus. The physical examination just before esophagoscopy, a few hours after she had swallowed the tack, was negative, except for a slight rise of temperature, 99°. The tack was imbedded in the post-wall of the esophagus and was removed without difficulty. The interesting feature of the case was the postoperative course. The tack had perforated the esophagus. Edema of the post-wall of the pharynx was present the following day, with much swelling of the periesophageal structures. The neck was tender and the child had pain on moving her head. She swallowed liquids with difficulty. All these symptoms increased in severity until on the third day following removal, she had a temperature of 102.4°, pulse 130, W. C. 28,000. She was unable to swallow liquids and could not move her head without severe pain. The neck was tender, the pharynx pushed forward and edematous; no fluctuation was felt. The child was slightly improved the next morning, and was able to swallow a small amount of fluid. The temperature and pulse came down gradually and in about a week she was well. The surgical aspects of this case are important. With the fever, rapid pulse and high white count, together with the physical findings so well demonstrated by X-ray, external drainage of the area should be considered. The Surgical Service observed this case with us and decided to do nothing. The child made a prompt recovery, but it is probably the safest procedure to open this type of case because of the danger of a descending infection involving the mediastinum.

Case No. 6.—Mrs. J. H., age 30. Swallowed chicken bone two days previous to consultation. She gave a history of having had difficulty in swallowing and some pain. January 10, 1927, esophagoscopy was performed with the Jackson upper end esophagoscope. No foreign body was seen. The patient complained of severe pain in her throat following examination and further examination was deferred. She went home and on her arrival drank a glass of water and went to bed complaining of severe pain in the right chest. The pain increased and I was called to see her about four hours later. Her temperature was 100°, pulse 105, respiration 20. Morphin, ¼ grain, was given by hypo, and the patient was sent to the hospital. Physical examination at this time showed heart and lungs clear; subcutaneous emphysema over trachea and sternum extending to the right side. The patient was supported by 5 per cent glucose in salt solution injected under the skin. Two days later a surgeon was asked to see the case and he advised watchful waiting. The X-ray showed some broadening and density of the superior mediastinum. On the third day physical examination showed some tenderness in the right side of the neck behind the thyroid. Emphysema was present. A loud pericardial rub was heard. The fifth day X-ray showed the extension of the superior mediastinal border to the right and downward. An air pocket was present in the neck and mediastinum. The heart was displaced to the left. The left lower lobe of the lung revealed partial consolidation at the base. On the sixth day the patient was allowed a small amount of fluid by mouth without any apparent ill effect. Later on larger quantities of fluid were given without any signs of fistula. The swelling and pain in the neck had subsided somewhat. On the seventh day the patient grew suddenly worse. Temperature 104°, pulse 130. W. C. 25,000. The physical examination showed compression of the right lung by the mediastinum. All signs were aggravated. On the ninth day a swelling suddenly appeared in the neck just above the clavicle on the right side. This resembled an air pocket. The patient's condition was much worse. She was very cyanotic. Opening the neck at the site of the swelling released air. A tube was inserted and suction applied. A large amount of fluid was obtained during the twelve hours previous to the death of the patient.

Hardly any comment is necessary in this case. It was purely a case for external surgery and should have been operated upon at once in order to wall off the mediastinum. The perforation was high up and early intervention might have prevented infection lower down. Certainly a postmedianostomy should have been performed later as the infection progressed. There was nothing to lose and everything to gain by surgery.

In all sharp foreign body cases there is a great danger of perforation of the esophagus, so that extreme care must be exercised even with the esophagoscope. Too much emphasis cannot be placed on the warning to those who are inclined to push into the esophagus blindly to dislodge a foreign body. There is evidence to show that perforations occur in the esophagus without the formation of pus. Esophagitis and periesophagitis appear; the patient has a reaction and the infection subsides. This happens in the thoracic as well as in the cervical region. Perforation is well known to be a serious and usually a fatal complication, therefore a few observations regarding the treatment are in place. Perforation exposes the mediastinum to infection at once, hence the only treatment is operation, and if this is to be of any value it must be done immediately. The question of which case to operate and which to let alone is difficult to decide. A review of the literature on the subject shows that Schlemmer reported on 529 esophageal foreign body cases in which fifteen deaths occurred. Thirteen of these were due directly to the foreign body, sixteen were operated on, and of these, seven recovered. Schlemmer is strongly in favor of early operation and he bases his principal indication for operation in upper esophageal cases on the presence of subcutaneous emphysema.

Killian, in 1922, gave a review of the literature dating from 1900, in which he collected 389 surgical foreign body cases, of which 169 were operated upon. Of these, 70 died, giving a mortality of 40.4 per cent. Killian gave the following indications for operation:

1. Subcutaneous emphysema.
2. Increasing fever, pain, swelling and tenderness.
3. Dangerous hemorrhage.
4. Tracheoesophageal fistula.

Von Eicken is less inclined to operation in upper esophageal cases. He reports eight cases in which spontaneous recovery took place without interference. Myerson recently reported twelve cases in which the majority recovered without surgical intervention, and he states that the experience gained from this group would lead one to defer external operation.

Glogau, from an experience gained in Vienna, is strongly in favor of early external drainage. Marschik also throws the weight of his opinion with those who favor early operation.

SUMMARY.

In speaking of the indications for external surgery, we generally find pain as the first symptom. Fever, rapid pulse and difficulty in swallowing rapidly ensue. Swelling of the tissues and emphysema are also accompanying signs. The emphysema may be present in a slight degree and remain unrecognized unless the X-ray is employed, as explained by Iglauer in 1924. The X-ray is an important adjunct for determining the amount of swelling and the progress of the case. With these signs present, and, in addition, a high white count, there is every reason for opening the neck. Of course, each case is a problem in itself, and no set rules should guide the surgeon in handling it. Marscke remarks that it is safer to operate too often than to withhold operation. From my experience with the last case reported this appeals to me.

The infection first establishes itself in the loose perioesophageal tissues, and from there spreads out into the fascial planes of the neck, descending between the sheaths into the mediastinum. It is a relatively simple matter in upper esophageal perforations to open the neck and drain this area. It is not essential to remove the foreign body through the incision but it is essential to provide drainage. If the foreign body is found outside the esophagus, as in the case reported by Iglauer and Ransohoff, it can be removed. I believe that Marschik's method is a very effective one for establishing drainage and preventing the descent of the infection. His technic briefly is to open the neck in front of the sternomastoid muscle, bluntly dissecting down to the anterior margin of the vascular sheath. The omohyroid muscle is divided and, following the course of the

vessels, an iodoform gauze strip is packed in place at their lowermost limit to wall off the anterior mediastinum. The thyroid gland is then lifted forward and an iodoform gauze tampon inserted beneath it to wall off the posterior mediastinum. The abscess cavity is then drained. Marschik refers to this procedure as prophylactic mediastinotomy.

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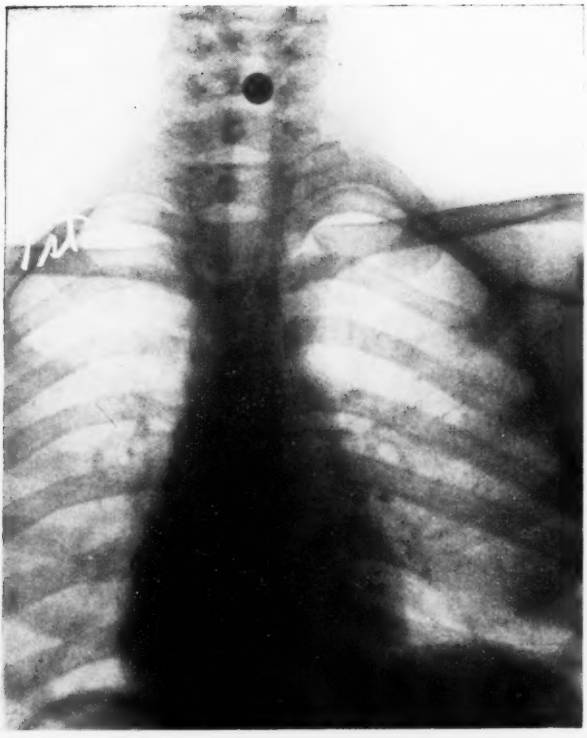

Fig. 1. Case 5. Showing thumb tack in the esophagus.

U. OF MICH.

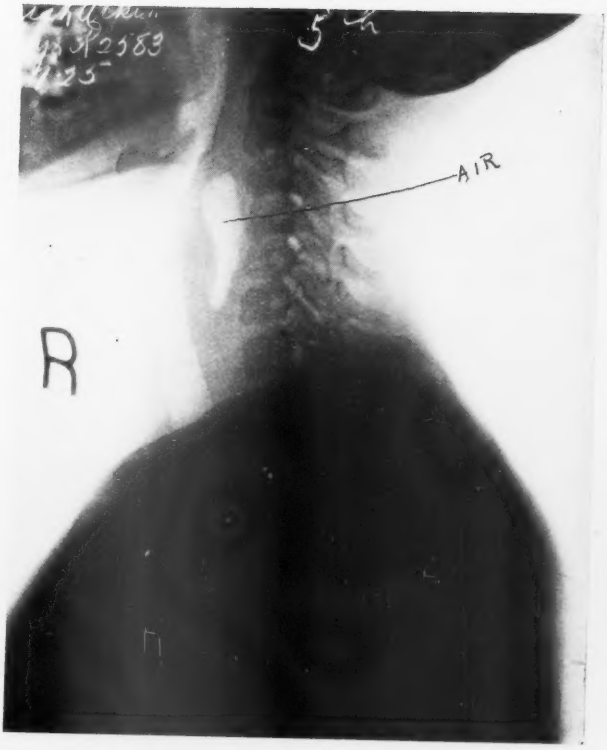

Fig. 2. Case 5. Shows a pocket of air in the retroesophageal tissues.

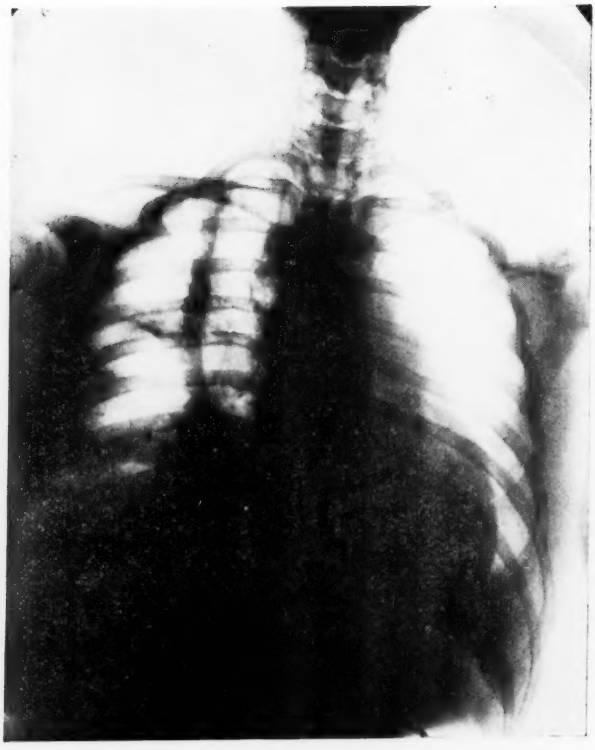

Fig. 3. Case 6. Showing the shadow of the mediastinum encroaching upon the right lung.

XXX.

HISTOPATHOLOGY OF NOSE AND THROAT IN EXPERIMENTAL CRETINISM.*

By

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The histopathologic appearance of the tissues of the nose and throat in various disturbances due to the glands of internal secretion have been but little studied. Careful investigation of the findings in experimentally produced and controlled ailments and comparison with the picture seen in obscure affections of the nose and throat in humans may possibly throw some light on the origin and nature of these disturbances. This paper will concern itself with the microscopic appearance of the tissues of the nose, tongue, esophagus, larynx and trachea in experimental cretinism in rabbits.

One of us (M. M. K.) has had considerable experience in producing this condition in these animals by removal of the thyroid glands. They are operated upon when very young (two to three weeks of age) and are kept, together with controls of the same litter. At two months of age the changes produced are already very noticeable. The appearance after such a time of an animal such as the rabbit deprived of its thyroid glands is characteristic. The entire growth is stunted. Because of a lack of development of the intermediate cartilages the legs are short and deformed. There is a pronounced

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*Read by invitation before the meeting of the Middle Section of the American Otological, Rhinological and Laryngological Society, at Chicago, January 9, 1929.

†This work has in part been conducted under a grant from the Douglas Smith Foundation for Medical Research of the University of Chicago.

pot belly. The teeth are poorly developed, the hair is coarse and dry and the animal weighs much less than its healthy control.

THE NOSE.

The two nasal fossæ in the rabbit are separated by a septum chiefly cartilaginous and derived from the mesethmoid and the perpendicular plate of the ethmoid. Only the former is bony. The turbinated bones are infolded and scroll-like, and consist of the concha inferior or maxilloturbinal and a posterior structure, the ethmoturbinal, which has a dorsal projection, the nasoturbinal.

The mucosa covering the maxilloturbinal is respiratory in character, while that of the ethmoturbinal is of a special type concerned with olfaction.

Piersol gives an excellent description of the histology of the human nasal mucous membrane, which applies in the main to that of the rabbit. "The respiratory portion, which is the only part we are concerned with, is lined by a stratified or pseudostratified (Stöhr) columnar epithelium, ciliated in type, with basal cells, irregularly columnar. Goblet cells containing mucous are common. Within the epithelium migratory leucocytes may be found.

"The tunica propria is composed of bundles of fibroelastic tissue; loose in its superficial layers and firmer and compact toward the underlying periosteum. The loose areas contain many lymphocytes, often gathered together to form lymphoid masses; characteristic, too, are the large blood spaces and so numerous as to confer a cavernous nature on the mucosa. These spaces are most highly developed in the lower turbinate and the ends of the middle turbinate. In the connective tissue between the corpora cavernosa are glands and the blood vessels destined for the subepithelial stroma. The glands are numerous tuboalveolar in form and chiefly mixed mucous in type."

The nasal cavities of rabbit cretins, corresponding to the general stunting in size of the entire animal, are smaller than in the normal control, as can be easily seen by comparing cross sections at about the same level. The bony structure of the turbinated bones and the cartilage of the septum show no marked deviation from the normal, neither does the epithelium.

The subepithelial connective tissue or stroma, however, does seem to be looser in character than in the normal. There are no abnormal cells such as eosinophiles.

THE TONGUE.

The tongue is a muscular organ covered by mucous membrane. Its dorsal surface in the rabbit is divided into a posterior smooth and hard portion and an anterior soft and rougher portion occupied by fine low elevations, the fungi form papillæ. At the posterior end of the smooth portion there is on each side a minute spherical elevation set low into the mucous membrane, the vallate papilla, and in a more lateral and anterior position an oval area, the papilla foliatta, the surface of which is marked by fine parallel ridges. Both vallate and foliate papillæ are occupied by microscopic taste buds. The mucosa covering the tongue is similar to that of the neighboring oropharynx. The epithelium is stratified squamous in character with an underlying tunica propria and a submucosa intervening between the complex bundles of striped muscles. (Bensley.)

The tongue in cretin rabbits presents under the microscope a picture differing little from the normal. This applies to the epithelium with its papillæ and to the musculature. Only the tunica propria seems looser and of greater thickness and this change is not marked.

THE ESOPHAGUS.

The esophagus consists of four coats of mucosa, submucosa, the tunica muscularis and the tunica fibrosa. The epithelium is thick and stratified squamous in character, and its tunica propria consists chiefly of fibrous connective tissue and elastic fibers. The submucosa is areolar in nature and thrown up into ridges and folds, and contains in its depths a thin layer of involuntary muscle. There are scattered lymphocytes and numerous collections of these cells to form distinct follicles. The submucous layer is of varying thickness and loose. It contains many glands, mucous in type. The muscular layer is comprised of an inner longitudinal and an outer circular coat. The tunica fibrosa is loose areolar above the diaphragm, beneath which there is a serous coat derived from the peri-

toneum. In cretin rabbits the esophagus is a smaller structure than in the normal, although in its histologic appearance it is identical, with the exception of considerably looser arrangement of the subepithelial stroma in the thyroidectomized animal. There are no atypical cells such as eosinophiles.

THE TRACHEA.

The mucosa of the trachea consists of a columnar epithelium, ciliated and pseudostratified in character. Beneath the basement membrane is a tunica propria containing elastic fibers and numerous lymphoid cells, often gathered in distinct collections so as to resemble lymph nodes. The submucosa contains numerous tracheobronchial glands, mixed in their nature—i. e., serous and mucous. In the fibrous outer layer of the trachea are the cartilaginous rings, each an incomplete circle in shape with the open end toward the esophagus. Between the ends of the cartilages are bundles of smooth muscle tissue transverse on the inner side and longitudinal on the outer.

With the exception of the difference in size in the cretin and an apparently thinner epithelium in the animal operated on, there is no noteworthy change from the normal.

THE LARYNX.

The larynx, as in the human consists of a cartilaginous skeleton surrounded by muscles and composed of the unpaired cricoid, thyroid and epiglottic cartilages and the paired arytenoid and corniculate cartilages. The cartilages are chiefly hyaline. The mucosa lining the pharynx resembles very much that of the pharynx, of which it is a continuation. The epithelium is columnar and stratified with cilia. On the vocal cords and on the laryngeal surface of the epiglottis, as well as on the anterior surface of the arytenoids, the epithelium is stratified squamous in character. The vocal cords in the rabbit are rudimentary. In the tunica propria, composed chiefly of fibrous tissue with numerous elastic elements, are many collections of lymphoid cells resembling nodules. The submucosa varies in thickness, depending on how tightly the mucous membrane is bound down to the surrounding structures. It contains numerous mixed tubuloalveolar glands.

The larynx of the cretin rabbit, with the exception of being smaller than its normal counterpart, shows no noteworthy histologic changes.

SUMMARY.

It seems advisable to study the histologic appearance of the tissues of the nose and throat in as many induced disturbances as possible. These disturbances will include those due to glands of internal secretion, such as the thyroid, pituitary and gonads, for example. Such studies may be one avenue of approach that will make it possible to determine more exactly the nature of obscure diseases of the nose and throat.

In a small number of cretin rabbits of different ages, beyond a general reduction in size of the nasal passages, larynx, trachea, tongue, etc., and an increased thickness and looser structure of the subepithelial connective tissue, there were few changes in the microscopic picture as compared with the normal.

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180 North Michigan Avenue.

104 South Michigan Avenue.

University of Chicago Medical School.

Fig. 1. Four-months-old cretin rabbit and normal control showing marked stunting in size of operated on animal.

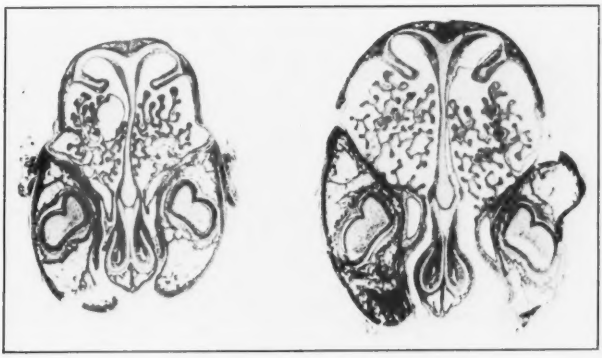

Fig. 2. Cross section through nose of two-months cretin rabbit (left) and normal control (right), showing smaller size of nasal cavities in the cretin. x 5.

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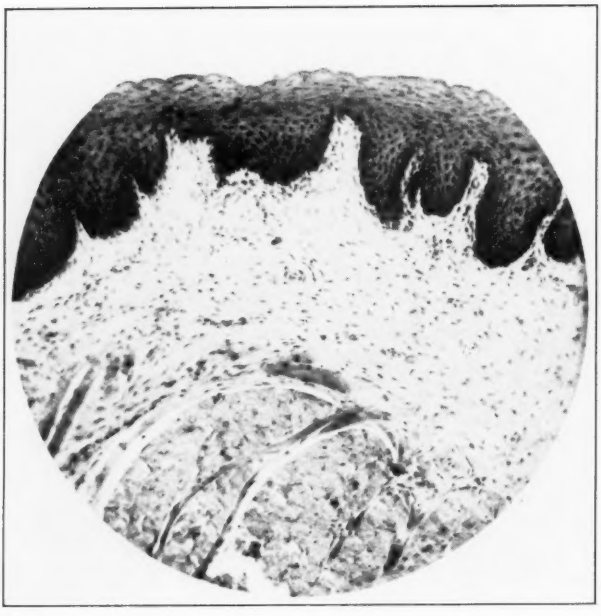

Fig. 3. Cross section through anterior tip of tongue in two-months-old cretin rabbit showing increase in subepithelial connective tissue. x 125.

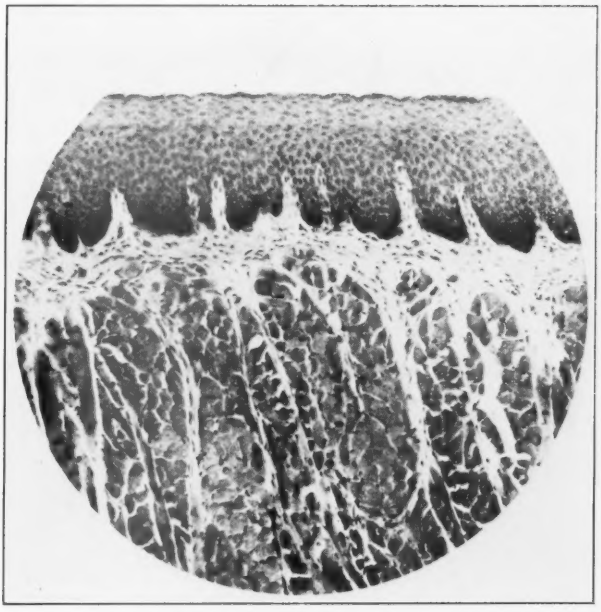

Fig. 4. Cross section through anterior tip of tongue in two-months-old control rabbit showing normal subepithelial connective tissue. x 125.

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Fig. 5. Cross section through esophageal mucosa and submucosa of two-months-old control rabbit showing normal subepithelial connective tissue. x 125.

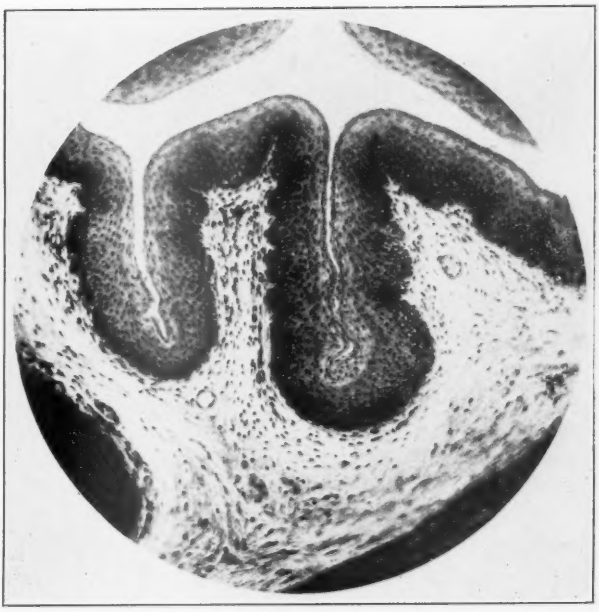

Fig. 6. Cross section through esophageal mucosa and submucosa of two-months-old cretin rabbit showing increase in subepithelial connective tissue. x 125.

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Fig. 7. Cross section through trachea and esophagus of four-months-old cretin rabbit. Note smaller size of organ as compared to normal in Fig. 8. x 10.

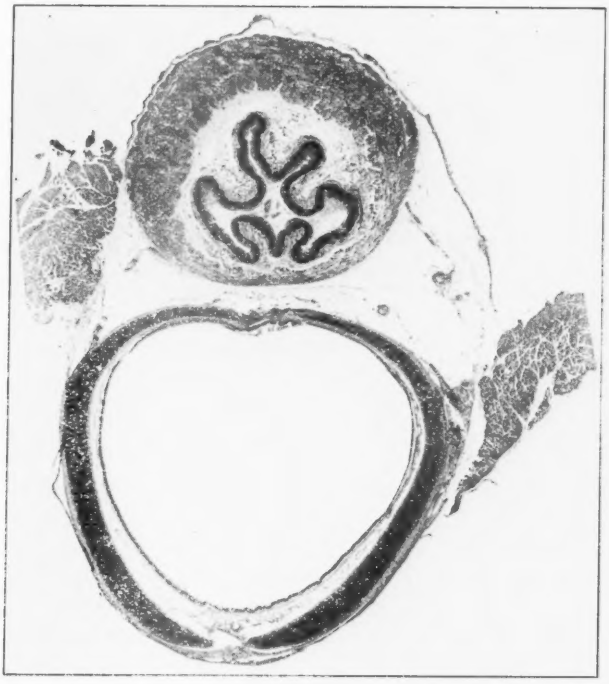

Fig. 8. Cross section through trachea and esophagus of four-months-old normal rabbit. x 10.

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XXXI.

NERVE BLOCK IN AMYGDALECTOMY.*

By Homer A. Trotter,

Buffalo.

Postoperative pain following enucleation of the tonsils, to say the least, is distressing. A knifelike, cutting pain at the field of operation, which is referred to the ears, is characteristic of the operation and augmented by deglutition to the point almost of distraction, as evidenced by the distortion of the physiognomy. Especially on rising in the morning, after the musculature of the tonsils has been at rest, the movement of the traumatized area produces intense pain, which gradually wears off as the day advances. Usually, one side is more painful than the other. The duration of postoperative pain is from one to several days, depending on the case.

Obviously the elimination of this distressing pain and general discomfort would be appreciated by the patient undergoing tonsillectomy. Postoperative pain can be eliminated by nerve block into the nerve supply of the tonsil if proper technic is administered.

Various substances have been introduced from time to time to paralyze sensory nerve endings by injection into the tissues. Cocain hydrochlorid, beta-ucain hydrochlorid, alpin, stovin, novocain and quinin and urea hydrochlorid are the best known and used in solutions ranging from ¼ of 1 per cent to 5 per cent. Novocain or procain has practically replaced all of the other substances mentioned, but does not produce prolonged anesthesia lasting several days as quinin and urea hydrochlorid.

Nerve block in enucleation of the tonsils is a success. One hundred and twenty-six cases have been operated upon and the results are satisfactory. Numerous advantages are appreciated compared with the other methods of tonsillectomy, and few disadvantages are to be considered.

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*Read before the Buffalo Triological Society, February 12, 1929.

Nerve block may be described as follows: When an anesthetic solution is injected in the vicinity of a nerve trunk it penetrates by way of the perineurium into the neuroplasm, or central nerve substance, inhibiting its conductive function and anesthetizing the entire peripheral area supplied by the nerve trunk. Properly injected, an anesthetic solution into the nerve supply of the tonsil will completely anesthetize the organ and permit its removal without pain.

ANATOMY.

The recent revision of the anatomy of the muscular attachments of the tonsil by Fowler and Todd,* has made it possible to perform a nerve block enucleation of the tonsil.

We have been instructed in the past that the tonsil is placed between the anterior and posterior pillars, and reposes upon the superior constrictor muscle. The superior constrictor is not in relation and has no definite connection with the tonsil. The structure which has been mistaken for the superior constrictor is another muscle which is attached to the tonsil and called by some the tonsillar ligament. This muscle bundle is a new discovery and is attached to the groove at the junction of the middle and lower third of the tonsil and appears to divide the upper from the lower pole. This muscle has been called the tonsillopharyngeus. It holds the tonsil in position and is accompanied by the nerve, blood and lymphatic supply to the tonsil. In the removal of the tonsil the tonsillopharyngeus must be severed. The nerve supply to the tonsil is from the posterior palatine and the rami of the glossopharyngeal. These nerve trunks converge and run side by side as they approach the tonsil and are in immediate relation with the tonsillopharyngeus. The main blood supply is given through the descending palatine artery, which supplies the capsule and tonsillar branches of the dorsalis linguae. Numerous lymphatic vessels supply the tonsil.

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*Fowler and Todd: The Muscular Attachments of the Tonsil. American Journal of Anatomy, Vol. 90, No. 20, 1927.

The Journal of the American Medical Association, Vol. 90, No. 20, May 19, 1928.

SURGICAL SIGNIFICANCE.

Injecting an anesthetic solution into the tonsillopharyngeus area will produce a nerve block because at this point both nerves run parallel. In no other location can nerve block be accomplished by a single injection.

The tonsillopharyngeus muscle is important from the surgical aspect because it must be divided in tonsil removal.

Careful dissections of the tonsil show delicate areolar tissue separating the true lymphatic tissue from the muscles of its bed. This areolar tissue is so arranged that it can be separated into layers, between which are spaces of varying depth containing mucous glands, small veins and fat cells. The spaces in the areolar tissue account for the ease in which injection can be made and the ease with which the upper half of the tissues can be dissected.

The palatoglossus muscle is easily separated from the tonsil with which it is connected only by a slight fibrous submucosæ. Care must be used not to "buttonhole" the muscle at its outer edge.

The palatopharyngeus forms the posterior and upper part of the tonsillar bed. Difficulty is experienced in some cases in dissecting scar tissue caused by chronic changes in the tissues, as in quinsy.

In freeing the lower pole of the tonsil, the proximity of the glossopharyngeal and posterior palatine nerves should be considered.

To secure postoperative comfort following general anesthesia, a nerve block can be performed with the patient alseep.

NERVE BLOCK TECHNIC.

The patient should be placed in an upright position. Confidence in the procedure of nerve block should be given the patient. No food is to be given before the operation.

The preliminary hypodermic injection of morphin sulphate, ¼ grain, and atropin sulphate, 1/150, is omitted because of nausea which develops in a few patients and is unnecessary.

Previous to nerve block, where gagging and coughing interferes with the surgical procedure, the mucous surfaces of

the anterior and posterior pillar, uvula, base of tongue and pharyngeal wall are painted with cocain hyrodchlorid (flake). This anesthetizes the mucous membrane immediately and no evidence of cocain absorption is observed. A well constructed tonsil syringe, of three cubic centimeter capacity, is used. A specially built tonsil cannula needle, 23 gauge, with three-fourths of an inch penetrating depth is required, and the needle should be nonflexible. The field of injection is sterilized with alcohol.

The anesthetic solution used is quinin and urea hydrochlorid, one-half of 1 per cent, 1 cc. to each tonsil. Adrenalin hydrochlorid, three drops, 1/1000, is incorporated with the anesthetic solution to secure contraction of the blood vessels. One and one-quarter cubic centimeters is the total fluid volume injected into the tissues of each side. Fifteen minutes are allowed for complete anesthesia, and if the anesthetic solution is properly injected tonsillectomy can be performed painlessly and practically bloodless.

Quinin and urea hydrochlorid solution is used because it produces an anesthesia lasting several days and in some cases lasting eight days.

The patient is instructed to partly close the mouth in order to relax the cheek. The needle pierces the lower one-third of the palatoglossus muscle a little to the right of the median line of the muscle at this location. After passing through the muscle, the needle enters a space occupied by areolar tissue and then comes in contact with the capsule of the tonsil. The needle follows the edge of the capsule until resistance is met, which resistance is the tonsillopharyngeus muscle. The nerve supply is in direct relationship with the tonsillopharyngeus. Injection is made into this muscle bundle to produce nerve block.

The dissection method is employed, using Eve's wire snare in the enucleation of the tonsil.

One hundred and twenty-six cases have been operated upon with nerve block technic and little postoperative discomfort has been observed. The patients were able to partake of food and an absence of pain referred to the ears was observed.

The advantages of nerve block are:

1. Bleeding is much less under local anesthesia.

2. Mental shock is much less under nerve block except in unusually nervous patients; for such, give general anesthesia.

3. Damage to teeth is less liable to occur in the absence of a mouth gag.

4. In cases of cardiac and pulmonary disease, nerve block is indicated.

5. Surgical shock is much less under nerve block when properly administered.

6. Better operative results are obtained by local anesthesia than with the patient asleep.

7. The muscles of deglutition are not interfered with, using nerve block technic. Immediately after the tonsils have been removed a glass of water can be swallowed without inconvenience. The patient has complete control of swallowing and the condition of aspiration pneumonia may be prevented by nerve block anesthesia.

8. Healing is more rapid under local anesthesia because the nutrient equilibrium of the patient has not been interfered with except to a slight degree, while general anesthesia completely upsets the metabolic function.

9. Postoperative discomfort is eliminated with quinin and urea hydrochlorid, which is most suitable of all the official salts of the alkaloids for hypodermic administration on account of being freely soluble and neutral in reaction. I have not experienced an irritating action on the tissues and have not observed any reaction from the salt.

Advantages of nerve block compared with the infiltration method:

1. One injection into the nerve supply of the tonsil is sufficient, thus avoiding unnecessary traumatism.

2. The infiltration of infected areas can be avoided.

3. A small amount of anesthetic solution is required to produce complete anesthesia, without pressure and into loose areolar tissue.

4. The removal of the tonsils drains the field of infiltration by nerve block and assists to prevent sluffing, which has

occurred in the infiltration method by numerous scattered injections, where the anesthetic solution has been unable to escape.

DANGERS, ACCIDENTS AND COMPLICATIONS.

If proper preparation of the solution, syringe and needles has been carried out and the technic followed as described, untoward incidents should seldom occur during or after the injection of the anesthetic fluid. However, one should be in a position to cope with complications in the rare cases should they arise.

IDIOSYNCRASY.

Quinin and urea hydrochlorid is not a toxic agent, and symptoms are not observed in amounts ordinarily employed in hypodermic administration. The disadvantages of quinin and urea hydrochlorid occurs when injected in strength greater than one-half of 1 per cent to tissues other than areolar is liable to produce an extensive slough. Strengths of one-fourth of 1 per cent can be safely used without harm to the tissues.

I have used quinin and urea hydrochlorid, 1 per cent in strength, in nerve block without harmful results, because fifteen minutes following injection the tonsils have been removed and the injected area given free drainage and sluffing prevented.

I have found that one-half of 1 per cent solution of quinin and urea hydrochlorid produces anesthesia fully as well as 1 per cent solution. I have not experienced any ill effects of quinin and urea hydrochlorid.

Cocain hydrochlorid (flake) rarely produces symptoms of absorption. A few flakes are applied to the mucosæ of the nose for five minutes in suspected cases. If the patient becomes excitable or nauseated cocain should be eliminated and chloranodyne may be substituted and given orally.

Adrenalin hydrochlorid has been known to cause embarrassing symptoms because of idiosyncrasy. The heart is slowed, respiration increased, pain at the base of the skull, general stimulation of the sympathetic nervous system and collapse have been observed.

A few drops of the solution should be injected at first in cases suspected of idiosyncrasy before operation.

Psychic shock and fainting may occur in a few cases. This type of individual should be given general anesthesia. If this condition should occur during operation the treatment should be lowering the head, fresh air and smelling salts. Following this treatment it is usually possible to proceed immediately with the operation.

BREAKING THE NEEDLE.

This accident occurs occasionally. If the needle is not allowed to become rusty or bent from overuse, this accident will rarely happen. Breakage may be due to faulty technic, causing undue bending of a needle or a sudden movement of the head by the patient.

Postoperative pain becomes negative due to prolonged anesthetic effect of quinin and urea hydrochlorid, which may last as long as eight days.

Postoperative hemorrhage may follow any method of tonsillectomy. There may be some slight bleeding one or two hours after the injection, due to the reaction following vasoconstriction by the adrenalin. All operations for enucleation of the tonsils should be done in a hospital for reasons of care and safety.

Infection or tissue necrosis following the injection of a local anesthetic can be traced to some error in technic, such as stale and infected solution, lack of sterility of needle and syringe, irritating chemicals in solution, such as phenol, formaldehyde or an injudicious injection into a focus of infection.

Unduly prolonged duration of local anesthesia cannot be ascribed to the action of the anesthetic solution but to either an injury of the nerve by the needle during the operation or to the presence of alcohol in the syringe at the time of injection. Care should be exercised to wash out all of the alcohol before filling the syringe with the anesthetic.

In the series of cases which have been operated upon by means of nerve block, not a single case showed idiosyncrasy to adrenalin or quinin and urea hydrochlorid. Not a single case presented sloughing.

Fainting has not occurred in any case. Two cases presented lack of mental cooperation and complained of discomfort and pain during the operation. However, I do not believe that

actual pain was experienced, for the reason that physical manifestation of pain was not in evidence.

All questionable needles were discarded. I have had none break in the tissues.

Two cases of postoperative hemorrhage developed, one two days after the operation and another five days. They were not serious and were caused by the separation of the exudate from the granulating surface.

Infection or necrosis of tissue or prolonged duration of local anesthetic has not been experienced.

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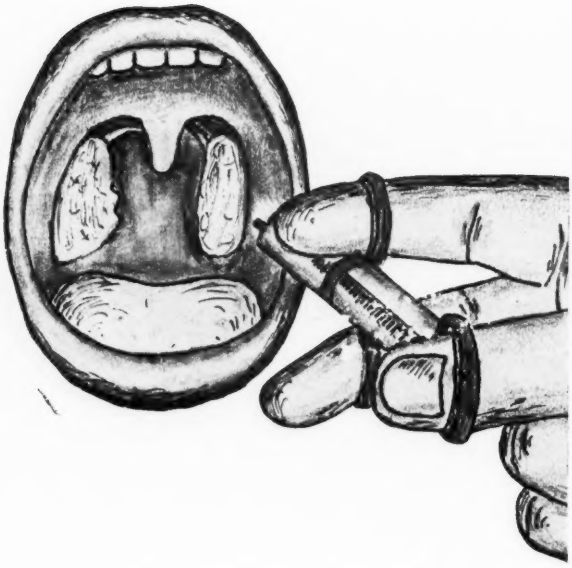

Fig. 1. Technique of Nerve Block.

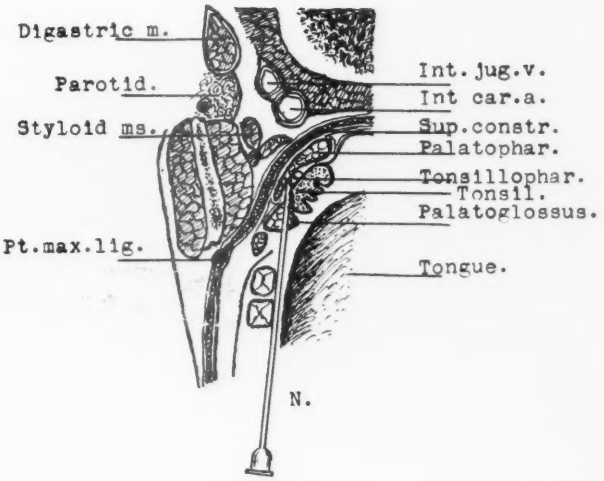

Fig. 2. Cross section through the faucial pillars and the tonsil, showing the direction of the needle N.

XXXII.

ABORTIVE TREATMENT OF PERITONSILLAR INFLAMMATION.

By W. R. Thompson, M. D.,

Fort Worth, Texas.

It is sufficient to say, first, that for one who has had only a limited experience in acute inflammatory throat trouble the likelihood of making a mistake in diagnosis is quite remote; second, with the method of treatment about to be described, if given to any patient with acute inflammation of the tonsillar region, regardless of diagnosis, the results would be harmless if not beneficial.

I feel sure I voice the sentiment of my hearers when I say the treatment of acute peritonsillar inflammation, as described in all of our textbooks, is practically worthless. In fact, they all tell us we may give internal remedies and make local application but if the infection is sufficiently virulent the result will be an abscess.

The amount of time lost in getting through with an attack of peritonsillar inflammation treated on the expectant plan, the pain, discomfort and danger to the patient should be sufficient to warrant the cordial reception of any procedure that possesses even a limited degree of merit.

For some years I have depended solely upon local depletion by means of a deeply seated self-retaining drainage tube, and so far am glad to say I have no desire to make any change. I fear the simplicity of this measure may cause some skepticism, but I assure you that if you give it a trial your patients will have no cause for regret.

The technic of this operation is as follows: A stab incision with a bistoury (I prefer a cataract knife) is made external to the anterior pillar through the region most generally selected when evacuating a peritonsillar abscess. From the appearance of the surface, one will have but little difficulty in locating the point of greatest infection. Care should always be

taken to see that the stab is external to the capsule and extends well back of it, in order that drainage may be complete. This stab incision is now enlarged with long slender scissors until the tube can be easily inserted. I am proud to be, so far as I know, the first to use a drainage tube in the peritonsillar region. This tube consists of a piece of small rubber catheter, around one end of which one or two turns of a very narrow strip of adhesive is placed. This end of the tube is carried with bayonet forceps to the bottom of the opening above described, the adhesive forming a shoulder which holds the tube in position. The portion of the tube projecting is snipped off even with the surface. From day to day, in cases of much swelling, it may become necessary, as the swelling subsides, to cut the projecting portion of the tube, thus preventing annoyance. The tube should be worn until all active inflammation has subsided. Anticipating what may be in the minds of some of my hearers, I will say I have had only one tube to escape. This, I presume, was swallowed. The size and texture of these tubes render them harmless.

In the matter of hemorrhage following the incision, I have never had it occur beyond what would usually be expected. In case it should take place it could be controlled more easily in healthy than broken down tissue.

The treatment of peritonsillar inflammation on the expectant plan is unscientific. No up to date general surgeon would delay operation after a positive diagnosis of acute appendicitis until he was sure the appendix was full of pus, nor would he delay a free incision after the diagnosis of periostitis for pus formation. It appears as though peritonsillar inflammation is in a class by itself, and the unfortunate victim of such an attack is forced to suffer excruciating pain, starvation and the loss of from five to ten days or longer from his business, waiting for an abscess to form before relief can be given.

The title of this paper is "Abortive Treatment of Peritonsillar Inflammation." As a matter of fact, for years the drainage tube is the only treatment I have given for every stage of peritonsillar inflammation. If pus has formed, I insert a drainage tube. If the inflammation is slight, I insert a drainage tube. I cannot recall a single instance where resolution has

not started immediately following the insertion of the tube. I cannot recall a single instance where it was evident pus had not formed, that was not relieved of all pain and the patient did not continue with his daily duties in comparative comfort.

This operation is rendered practically painless by deep injections of novocain or a weak solution of cocain. The tubes are rendered sterile by boiling before the plaster is applied and by immersing in alcohol immediately before inserting. I have never had the plaster to leave the tube.

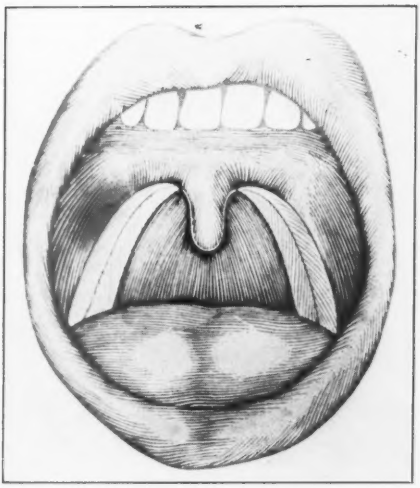

Fig. 1. Early appearance of peritonsillar inflammation.

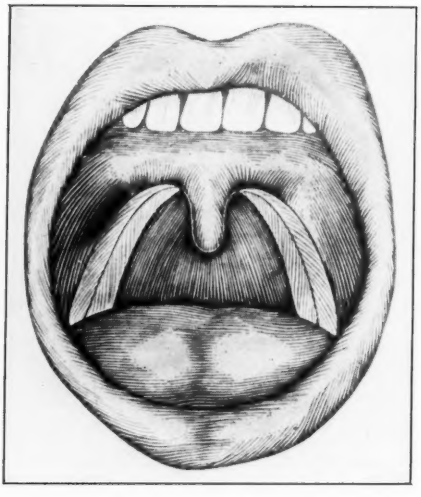

Fig. 2. Incision for tube.

Fig. 3. Tube ready for insertion.

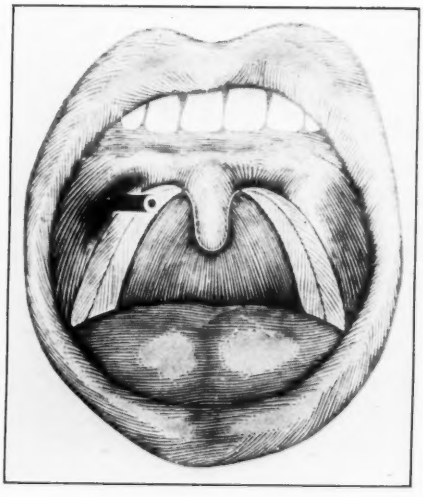

Fig. 4. Tube before clipping.

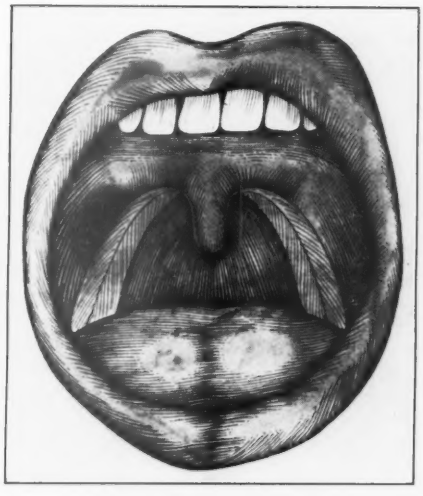

Fig. 5. Tube after clipping.

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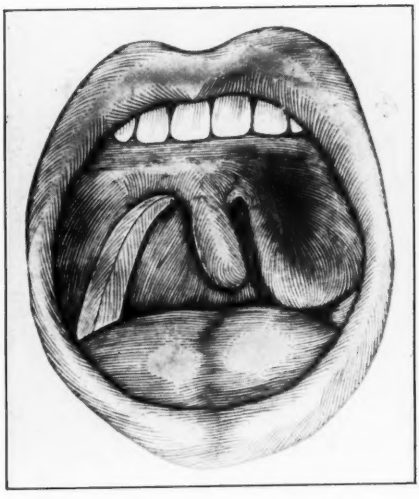

Fig. 6. Tube in peritonsillar abscess.

XXXIII.

ENCEPHALOMA OR THE SO-CALLED NASAL GLIOMA.*

By Jefferson Browder, M. D.,

Brooklyn.

During the development of the human embryo it is not an uncommon occurrence for a portion of one or both of the cerebral hemispheres to be extruded through one of the vulnerable points of the membranous clavarium—that is, the occipital, frontal, sphenoid or mastoid foramina.

This "herniated" portion of the brain usually consists of a thinned out cortex, enclosing a cavity filled with cerebrospinal fluid freely communicating with or a part of the ventricular system. This is the cephalocele. In rarer instances cephaloceles have been observed with their connecting stalk passing through the cribriform plate of the ethmoid bone, the foramen cecum, an enlarged foramen magnum, or through one of the suture lines of the skull.

There is a somewhat similar cerebral anomaly, different only in that the extruded mass is solid and in very rare instances not connected with the brain by a demonstrable pedicle. This condition has been dealt with under various captions, namely, nasal fibroglioma (Roche and Auglade),[1] nasal glioma (Schmidt,[2] Sussenguth,[3] Clark,[4] etc.), brain tissue within the nose (Guthrie and Dott[5]) and encephaloma (Berger[6]).

It was Berger who first clearly described the pathology of encephalocele and encephaloma, pointing out that the nerve cells of the latter were so changed that one was justified in considering it a tumor.

It is the purpose of this report to record an instance of a tumor situated in the midline over the nasal bones, attached to

*From the department of surgery, Long Island College Hospital.

both frontal lobes of the brain through an aperture situated at the site of the foramen cecum and containing glial tissue.

L. I. C. H., No. 27-4043.—L. V., an Italian infant, age 11 months, was admitted to the surgical service on May 27, 1927, for a "lump on forehead." The child was a well developed, full term infant who was breast fed until admission to the hospital. At birth there was present a small nodule about the size of an English walnut, situated in the midline over the base of the nose. The mass was not tender and caused no discomfort. At two months of age an attempt was made in Rome, Italy, to remove the nodule, but the surgeon told the parents that all of it had not been removed "because of hemorrhage." The wound healed without suppuration and infant was discharged from the hospital on the tenth day following operation. Since this time there has been no change in the size or shape of the tumor. Recently, however, the mother has noticed that the nodule seems tender. There has never been nasal discharge of bloody fluid and child has always breathed through her nose

Physical examination: Temperature 99° F., pulse 104, respirations 24. The patient was a well developed female child, whc appeared alert and of average intelligence. The head was symmetrical. The anterior fontanelle could be felt but no pulsation could be detected. The posterior fontanelle was closed. The pupillary distance seemed to be greater than usually seen. measurement, however, failed to confirm this. In the midline and in the long axis of the nose there was an irregular cutaneous scar, 2.5 cm. in length, which had a moderate amount of keloid formation at its midpart. Upon palpation there was felt a subcutaneous mass approximately 1.5 cm. in diameter which seemed to be painful, as the child cried and attempted to get away from the examiner. This mass was rounded, firm and could be lifted away from the nasal bones, but was attached to the underlying structures at its upper part. There was no change in size during violent movements or crying, nor could it be reduced in size by external pressure. The nasal canals were not occluded. Ophthalmoscopic examination revealed nothing unusual. Hearing was acute. The mouth was symmetrical. No teeth were present. The thorax and abdomen were essentially negative. The extremities were equally de-

veloped. The superficial and deep reflexes were present, equal and active.

Blood examination: W. B. C., 8,400; hgb. 96 per cent (Sabli); urinalysis, rare epithelial cell; Wassermann (blood serum), negative.

X-ray No. 60214: Anteroposterior and lateral examination of skull. In the anteroposterior view, a small circular defect was present in the region of the glabella. In the lateral view a soft parts mass was outlined over base of nose.

Operation, June 1, 1927: Under novocain, ½ per cent, the old operative scar was excised. By sharp dissection, the small mass was freed from below upward until a stalk was identified which led through the small circular bony opening described in the X-ray. The bony opening was enlarged in order to visualize the course of the stalk. The dura was incised at the upper aspect of the opening and the stalk, which appeared fibrous in character, was seen to divide into two parts, the larger part attached to the right frontal lobe, the lesser to the left. Both attachments were divided without any blood loss. There was no demonstrable communication with the ventricles. Wound closed with layer silk.

June 2, 1927. Child seemed none the worse for the procedure. Took feedings regularly. No vomiting. Small amount of cerebrospinal fluid drainage during first eight hours, but wound was dry when dressed twenty-four hours postoperative.

June 4, 1927. During the night of June 3rd, child's respirations became very rapid and temperature rose to 102° F. Lumbar puncture was performed. Fluid clear; cells 8; no increase in globulin; no rigidity of neck or Kernig sign. Examination of the thorax revealed impaired resonance, râles and bronchial breathing over the left lower lung posteriorly. Temperature gradually rose to 103° F., and death occurred on the morning of June 5, 1927. Autopsy not granted.

Pathologic examination: Specimen consisted of an oval shaped mass, 2.4 by 2 by 2 cm. The surface was irregular, one-half being covered with attached fatty tissue, whereas the other half had attached several strands of striated muscle tissue. The structure was firm but elastic in consistency.

On section, the mass was found to be solid and presented a smooth, glistening surface. Throughout there were relatively

broad, dense bands of connective tissue, which had a glistening, bluish white appearance. In the central portion there was a rather soft area from which cellular tissue could be scraped away very easily. Surrounding this soft area were many smaller areas of similar consistency, separated by dense bands of fibrous tissue. A small hemorrhagic area was present toward the periphery. This appeared recent, as there was no surrounding tissue discoloration. The outer zone was composed of fat and dense connective tissue.

Microscopic examination: The sections showed areas of cells with circular and oval shaped nuclei, containing a moderate amount of chromatin material. The cells in the center portion of these areas had no particular arrangement, but toward the periphery there was a tendency toward pallisading. With Mallory's stain, coarse and fine neurofibrille could be demonstrated. These above described areas were separated by broad bands of collagen material.

COMMENT.

This type of tumor is congenital, solid, benign and has never been described, except in the region of the nose, hence the term nasal glioma. That they are not a new growth but anomalously placed brain tissue is quite generally accepted; therefore, to apply the term glioma is misleading and should be abandoned.

As pointed out by Roche and Auglade,[1] there are three types: Intranasal, extranasal and a combination of both. The intranasal as well as the combined intra- and extra-nasal situation of such tumor may cause nasal obstruction, producing symptoms in no way different from those caused by any polypoid growth in the nasal air passage. For this reason, nasal obstruction in an infant should be carefully investigated before any operative interference is attempted.

The extranasally situated tumors are removed for cosmetic reasons only.

Histologically, the encephalomata are composed of embryonic type of nerve cells, neurofibrils and in some instances true nerve fibers. In this instance there was a large amount of collagen, which may be due to previous operative interference. The glial tissue was rather scanty and it probably was this

histologic picture that led several writers to use the term fibroglioma. There were no cells that would cause one to believe that there had been any unusual cellular activity.

CONCLUSION.

1. A case of nasal encephaloma which terminated fatally following the removal of the tumor has been presented. In as far as could be determined, death was due to pneumonia.

2. A brief discussion of the condition has been submitted.

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Fig. 1. Photograph of child before operation, showing the position of the tumor.

Fig. 2. Anteroposterior view of skull. The small cranial defect has been retouched.

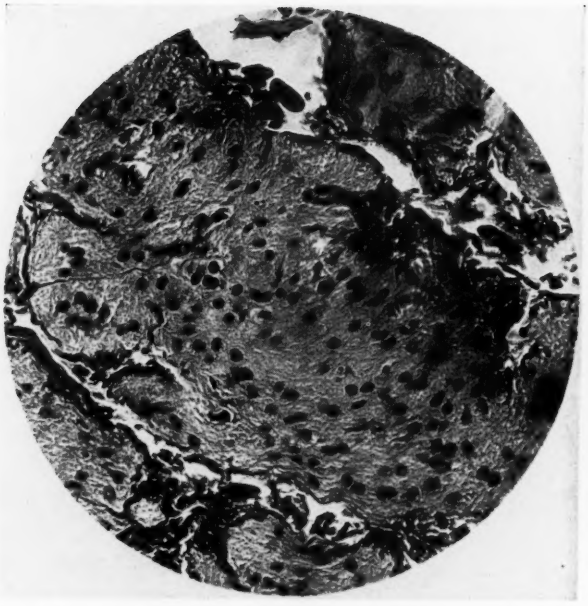

Fig. 3. Section of tumor. Hematoxylin and eosin stain. X 300.

Fig. 4. Section of tumor. Phosphotungstic acid hematoxylin stain. X 850.

XXXIV.

PATHOGENESIS OF OSTEOMAS OF THE NASAL ACCESSORY SINUSES.*

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The number of osteomas of the nasal cavity as well as the accessory sinuses, reported in the literature, attains at present considerable figures.

The statistics of Boenninghaus, completed by Dahman, enumerate 234 cases. These are distributed thus: Osteomas of the frontal sinuses, 88; those of the ethmoid, 45; of the antrum of Highmore, 11; of the sphenoid, 6; primary involved cavity not mentioned, 29.

In the group of 55 other osteomas have been included 20 external osteomas as well as 35 osteomas without indication, whether internal or external.

These statistics do not comprise one case of osteoma of the frontal sinus reported by Dr. Ischunin in 1890. After 1922, 35 other cases have been reported, viz.: Frontal sinus, 16; ethmoid, 13; antrum of Highmore, 4; sphenoid, 2. Thus the total number of cases published up to the present time is 240.

Osteomas of the nasal cavity have been included in Boenninghaus' statistics. Most of them fell into the group of the ethmoid.

Haas, Sonnenkalb and Eckert have compiled separate statistics of the osteomas of the nasal cavity. Eckert counts 35 cases of these and adds to them one case of his own, where the labyrinth of the ethmoid was the site of attachment of the osteoma. Two cases of osteoma of the nasal cavity originating from the ethmoid have been reported by Talpyss.

The classification of osteomas according to the direction of their growth is illogical. The localization of their pedicles

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Translated from the Russian by Alexis A. Sheremetefsky.

would be more correct as proposed by Coenon, concerning nasopharyngeal fibromas. From this standpoint osteomas of the nasal cavity should be referred, in the great majority of cases, to the ethmoid, from which they arise (Haas, Eckert, Talpyss).

In the cases of Martin and Sturm, reported as osteomas of the posterior end of the inferior turbinal, one has to deal not with osteomas, but with the bony hyperplasia of turbinals on the basis of the inflammatory process, viz., hyperstosis. In Boenninghaus' statistics, in the group of "outer osteomas" have undoubtedly been included exostoses that are not infrequently reported as osteomas.

If from the histopathologic point of view there is almost no difference between osteomas and exostoses, the clinical identification of these processes is highly desirable. In the case of the osteoma we have to deal with the neoplasm having unlimited growth and displacing of the adjacent structures.

Exostosis represents a hyperplastic bony phenomenon of more or less diffuse nature on the basis of some inflammatory changes in the periosteum.

Hyperplasias of the maxilla may be very easily confused with osteomas of the maxillary antrum, but being a purely inflammatory process they possess characteristics of inflammation.

Hence there is a difference between the clinical course and the operative procedures in the case of osteomas and bony hyperplasiæ or exostoses. In the case of exostoses the removal of the excess of the bony tissue is sufficient, while in the cases of osteomas the operation becomes more complex by the necessity of careful removal of the pedicle together with the portion of the bone whence the pedicle is derived. Incomplete removal of the pedicle results in the recrudescence of the osteoma. Similar cases have been described by Prof. Nikolsky, Wiegmann, Tod H., Thost. In the case of Thost, the osteoma recurred ten times.

Notwithstanding the large amount of study devoted to osteomas, notwithstanding the great statistical evidence, some aspects of the theory of osteomas of the sinuses accessory to the nose are still not made sufficiently plain.

One of these slightly explained points is the question of the histologic structure and the pathogenesis of osteomas. This is accounted for on the ground that in the great majority of studies dealing with osteomas only the clinical picture and peculiarity of the operative approach have been analyzed. Much attention has been given to the macroscopic description of the tumors removed. Microscopically three types of osteomas are usually to be noted: (1) Osteomas made up of eburnated bone (osteoma eburneum); (2) Spongiose osteoma (osteoma spongiosum), and (3) mixed osteomas (osteoma mixtum), the periphery being of compact bone and the center of spongiose. The last type is considered to be the most frequent. Wirgler, in 1919, reported an osteoma of the ethmoid where the center was rod-shaped and consisted of compact eburnated bone, while the periphery was made up of the spongiose bone.

Most writers think that in osteomas the structure of bone, both of compact and spongiose nature, does not differ from the normal bone.

From the outside the osteoma is covered with mucous membrane and periosteum, which forms its capsule.

Careful histologic researches have been made by Pfeiffer (1912) and by Eckert (1922). Each writer observed a single case of osteoma; Pfeiffer, the osteoma of the frontal sinus; Eckert, that of the ethmoid. Their studies are of considerable interest because in both cases the osteomas were young, and the results proved to be quite different from those which have been reported heretofore.

In both cases the periosteum covering the osteoma yielded some branches that penetrated deep into the mass of the tumor. These branches passed directly into the connective tissue that filled intervals between the trabeculæ in the spongiose bone. The growth of tumor went mainly from inside to outside, partly metaplastically, partly at the expense of the activity of the osteoblasts. At the stage of the intensive growth of osteoma the process of decalcification of the compact bone is observed, together with the process of ossification, after Eckert.

Scanty literary data as to histologic structure of osteoma, on one hand, and obscurity of their morphologic picture which

would enable one to recognize osteomas from bony hyperplasias (exostoses), on the other hand, compelled me to undertake a histologic study of four cases of osteoma that had passed in the last two years through the clinic of diseases of the ear, nose and throat in Tomsk. In three of them there were osteomas of the frontal sinus and in one that of the ethmoid.

Age, Sex	Time of Admission	Duration of Disease	Diagnosis	Operation	Wt. of Osteoma Removed (gm.)	Outcome
1. Male, 24	Dec. 17, 1926	8 years	Osteoma of left frontal sinus	Tumor removed piecemeal	37.0	Jan. 31, 1927, discharged
2. Male, 20	Dec. 27, 1926	8 years	Osteoma of right frontal sinus	Tumor removed piecemeal	25.0	Jan. 24, 1927, discharged
3. Female, 19	Aug. 8, 1927	3 years	Osteoma of right frontal sinus	Tumor removed piecemeal	20.0	Sept. 5, 1927, discharged
4. Male, 20	Apr. 27, 1928	6 months	Osteoma of left ethmoid	The whole tumor removed	18.0	May 8, 1928, discharged

See Figs. Nos. 1 and 2

In the first three patients the beginning of the growth of the osteoma coincides with the period of pubescence. In the last patient it was noticed at the age of 20 years. In this respect all our cases confirm the long established fact of formation of osteomas at the period of the maximum development of the skeleton. In the first two cases the microscopic picture was the same, on the whole. The tumor was covered with the mucous lined by stratified ciliated epithelium. There was the periosteum under the mucous membrane, with locally some branches projecting into the mass of the tumor. It was impossible to trace deeply the branches, as the tumor had been removed in small particles.

In its exterior parts the tumor was hard as ivory. In this the histologic structure of this part of the osteoma differs from normal bone. Together with portions where haversian canals are present, surrounded by the concentric rows of the bony lamellæ, the portions occur with an irregular arrangement of bony corpuscles, in bundles, and having the stratification that

runs parallel to the surface of the tumor. In some locations the tumor consists of some solid connective tissue fibers surrounded on all sides by a compact bone (Fig. 3). At the point of contact of the fibers with the bone a part of these passes directly into the bone. When stained with hemotoxylin and eosin, the connective tissue portions are colored more reddish than the adjacent bone.

In the deeper parts the tumor is composed of the spongiose bone formed by the trabeculæ interlaced in different directions. The interstices between the trabeculæ are filled with connective tissue containing a great number of fibers and a small amount of connective tissue. In such places, where the trabeculæ project as peninsulas into the portions of the connective tissue the connective tissue fibers, penetrating in bundles into the bone, are distinctly seen. Between them fibroblasts are present. In these parts of the tumor the formation of the new portions of bone occurs through metaplasia.

In Case No. 3, where the osteoma when macroscopically seen was spongiose and was removed without using a chisel the histologic picture differed from that just mentioned. On the outside the tumor was covered with ciliated columnar epithelium. There was in the submucosa a stratum of solid fibrous tissue externally resembling periosteum. The whole of the tumor consists of the connective tissue with large numbers of fibroblasts at various stages of development. In the entire thickness of the connective tissue there were numerous portions of the newly formed bone, having a variety of forms. The portions are connected with each other (Fig. 4). The center of these portions when stained with hemotoxylin and eosin is colored darker than the periphery, which has a pink hue. The growth of these portions occurs by metaplasia at the periphery, where the fibroblasts are directly transformed into bony corpuscles. Several bony portions have the structure homogeneous to boneless corpuscles. Fatty cells are absent in the connective tissue. There are numerous capillaries.

The osteoma removed from the fourth patient was studied in celloidin sections that ran throughout the entire thickness of the osteoma perpendicular to its long axis. On gross examination there was seen the difference between the pedicle of

the osteoma, which consisted of the spongiose bone and the mass of the tumor that was formed mainly by compact bone. The mucous membrane covering the osteoma was lined by stratified ciliated epithelium. The submucosa was of various thickness, partly edematous, partly very thin, so that the epithelium directly adjoined the periosteum. There was an inflammatory infiltration in the edematous portions of the submucosa. The periosteum covering the tumor over its whole extent consists of two layers, the outer being solid connective tissue fibers, and the inner well pronounced only in some portions and composed of osteoblasts arranged in small chains. Periosteum penetrates into all cavities on the surface of the tumor.

In the pedicle of the tumor some branches run from the periosteum, going into the entire thickness of the tumor and passing into the connective tissue that fills the lumens between the trabeculæ. The same is observed in the mass of the tumor itself, where the spongiose portions reach its periphery (Figs. 5 and 6). The branches of the periosteum in the pedicle are looser and contain a great amount of connective tissue cells locally with the admixture of fatty cells. The trabeculæ lying in the pedicle of osteoma and in the spongiose parts of the osteoma itself are interlaced forming a kind of net. They are stained much paler than the compact bone, owing to which the lesser contents of calcium salts in them may be supposed. Throughout the thickness of these trabeculæ the fibrillæ are distinctly seen, partly crossing, partly going parallel to one another. The connective tissue that directly adjoins the trabeculæ consists mainly of solid fibrous tissue, its single fibers entering the thickness of the bone. This is particularly pronounced in bony projections that freely penetrate into the adjoining connective tissue. The fibers which in bundles connect single trabeculæ with each other are stained after v. Gieson with the same color as the bone (bright red, Fig. 7). Some mature fibroblasts passing into the bony corpuscles are situated among the fibers. Somewhere in the trabeculæ the cells, similar in appearance to osteoblasts, may be noticed. There are numerous capillaries in the lumen between the trabeculæ.

The compact bone forming the tumor differs from the normal bone in its histologic structure. The haversian canals are practically absent. The bony corpuscles are arranged without

any definite order. There are numerous vascular canals running parallel to the long axis of the tumor and some perpendicular to it. The compact bone is likely to be developed out of spongiose bone, and the vascular canals indicate the places where in the lumens of the trabeculæ the fibrous tissue was placed which has been gradually transformed into bone.

The microscopic picture mentioned indicates with definite clearness that the formation of the bone in osteomas is made through metaplasia of the fibrous tissue that penetrates into the osteoma from the surface of the tumor. The fibrous tissue filling the intervals of the spongiose bone is the direct continuation of the periosteum that covers the osteoma from the outside (Fig. 5). The osteoblastic process that occurs here and there at the periphery of the tumor plays a minor part in the formation of bone. The atypical nature of the bone structure that takes place in all of our cases is explained by this.

Passing to an analysis of the theories of the origin of the osteomas we have to confine ourselves to two them.

According to the former, the osteomas develop from the embryonal cartilage; according to the latter, from the embryonal periosteum.

The theory of Cloquet, who considered the osteoma to be an ossified polypus, and Virchow's theory of development of the osteomas from the diploe of the bone have at present a purely historical interest.

It was Arnold who was the originator of the theory of development of osteomas from cartilage split off at an early stage of its development.

As the outstanding proponents of this theory Boenninghaus and Rokitansky should be named. In favor of this theory Boenninghaus reports the fact that exostoses of the limbs are particularly readily localized on the cartilage epiphyses. Rokitansky believes enchondromata to be the preliminary stage in the development of osteomas.

In spite of its seeming fitness from the clinical standpoint, Arnold's theory has no histologic points in its favor. Moreover, if osteomas were developed from the cartilage one would have to deal, in the clinic, with the osteochondromas of the accessory sinuses of the nose. However, among the great num-

ber of osteomas the only case of osteochondroma described originated from the ethmoid. (Case of Moure and Nadal.)

Among the adherents of the theory of development of osteomas from the periosteum Verneuil (1872) and more recently Bornhaupt, Tauber and Henrici should be mentioned.

An advocate of this theory is Zuckerkandl, who considers the osteoma to be a further stage in the development of the osteophyte. All these writers believe that the development of the osteoma takes place because of the increased activity of the osteoblasts of the periosteum—that is, in the osteoblastic manner.

The results of the microscopic examination of our cases show that the osteoblastic ossificatory process plays in osteoma a very small part, as compared with the formation of bone through metaplasia from the fibrous tissue. The fibrous tissue inside the osteoma is in its turn a direct continuation of the periosteum. The spongiose parts of the osteoma should be considered its younger parts. Furthermore the compact bone is formed from the spongiose bone.

The histologic study of the eburnean osteomas could have been of no value in the clearing up of the histogenesis of the osteomas. The theory of the periosteal origin of the osteoma, as based on the histologic grounds, should now be considered more acceptable. The presence of periosteum split off at the stage of the development of the organism is not yet sufficient for the appearance of the tumor. According to the recent theory of tumors, an exterior irritant is necessary apart from the power of the cell to blastomatose growth. Trauma and inflammatory processes in the nasal accessory sinuses may undoubtedly play the rôle of the exterior irritant in the development of the osteoma, of which there are indications in the history of the majority of cases. It is to be noted that the osteomas and nasopharyngeal fibromas have a series of common chemical and histologic characteristics. Their appearance in the period of the formation of the skeleton, their tendency to grow into the adjacent cavities and acquire an unfavorable clinical course in spite of the histologic benignity, their power of spontaneous reverse development—all this entitled Bornhaupt to draw a parallel between osteomas and naspharyngeal fibromas. On the other hand, a series of cases is reported where the bony

spongiose mass has been found in nasopharyngeal fibromas (Eckert, Glass, Wolf). The reverse has also been observed. Osteomas occur with a great amount of connective tissue. Our case No. 3 belongs to the latter type, where the bony masses have the form of islets embedded into the connective tissue rich in cellular elements. These osteomas seem to stand on the borderline between osteomas and fibromas.

On the basis of the above mentioned histologic material that fully confirm Pfeiffer's and Eckert's investigations, we may make the following conclusions:

1. The growth of the osteoma takes place from the inside outward by the metaplasia of fibrous tissue into bone tissue.

2. The osteoblastic ossificatory process that takes place at the periphery of the osteoma plays a secondary rôle in the growth of the tumor.

3. The fibrous tissue filling the interstices of spongiose bone is the direct continuation of the periosteum covering the osteoma from the outside.

4. The theory of origin of osteomas from the periosteum, split off at the stage of the development of the organism of the periosteum, is the most fundamental.

I am greatly indebted to Professor V. P. Miroluboff, director of the Pathological and Anatomical Institute of Tomsk University, for his kind supervision of the histologic preparations.

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Fig. 1. Osteoma of the left frontal sinus. Left eye displaced inwards and downwards. Case 1.

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Fig. 2. Osteoma of the right frontal sinus. The eye displaced downwards and outwards. Case 3.

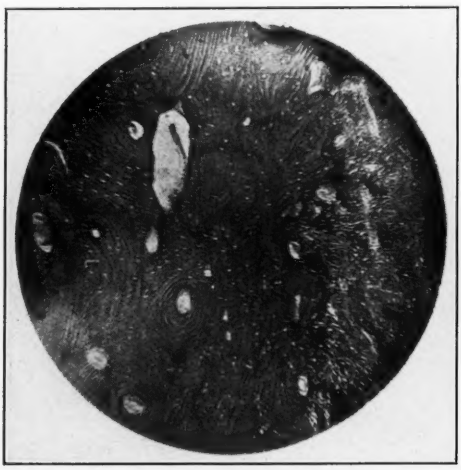

Fig. 3. The portion of solid connective tissue in the mass of the osteoma. Right, connective tissue; left, bony mass of osteoma. Case 2

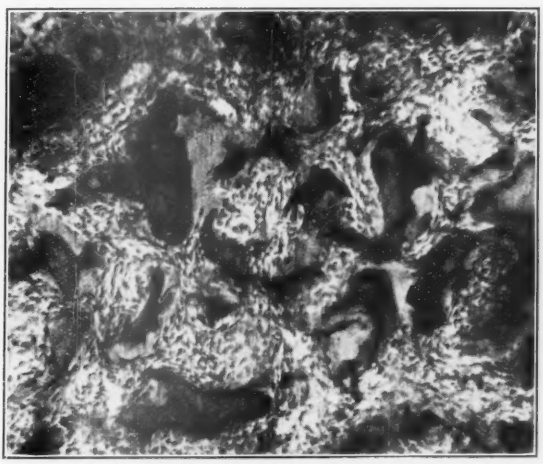

Fig. 4. Osteoma No. 3. Bony islets of various shape, locally fused with each other. Between them mature connective tissue.

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Fig. 5.

Figs. 5 and 6. The pedicle of the osteoma No. 4. The surface covered by ciliated columnar epithelium. Below submucosa and periosteum. From periosteum deeply into the tumor branches run passing directly into the connective tissue between the bone beams. Low power. No. 5 stained by the method of v. Giesen. No. 6 stained by haemotoxylin in eosin.

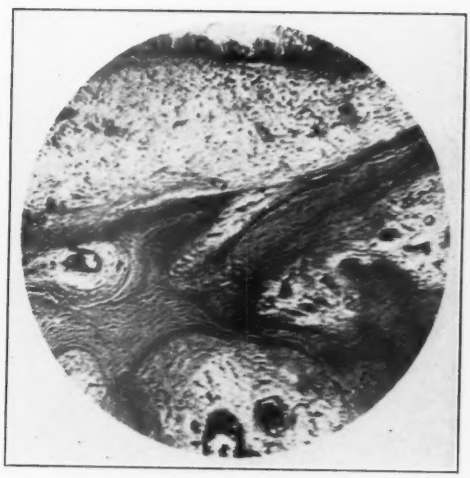

Fig. 6.

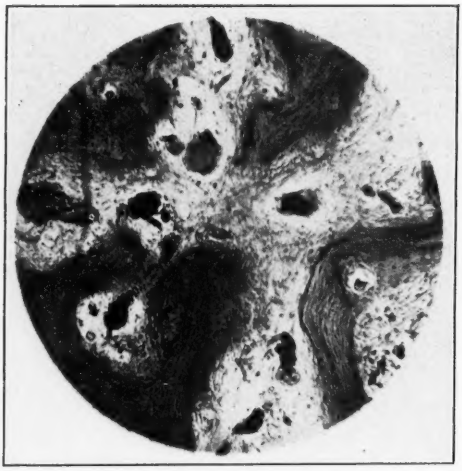

Fig. 7. Bundles of connective tissue fibres connecting the bone beams of osteoma and passing imperceptibly into the bone. Low power.

XXXV.

VALUE OF BARBITAL BEFORE LOCAL ANESTHESIA.*

By Roy A. Barlow, M. D.,

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The increasing number of uses of various local anesthetics in surgery, especially in nose and throat work, has resulted in the observance of toxicosis of varying degrees. Mayer has collected a number of cases in which fatalities occurred. It has been the experience of all of us to observe mild symptoms of cocain and novocain poisoning manifest by paleness, cold skin, rapid and shallow heart action and signs of collapse. To obviate this it has been common practice to administer morphin either alone or with atropin or scopolamin before an operation which is to be performed under local anesthesia. Even this measure was not entirely satisfactory, although some degree of efficacy was noted.

There has always been the hope that some drug could be given preceding the local anesthesia which would be more specific or would be an antidote for the symptoms of cocain or novocain poisoning.

In 1925 Tatum, Atkinson and Collins reported from the Laboratory of Pharmacology of the University of Chicago the results of experimental work in cocain poisoning in dogs and the neutralizing effects of barbital. It had been shown that the brain, especially the respiratory and other medullary centers were affected either by activating or in some way interfering with the proper action of the mechanism. The results of their work showed that the administration of barbital sodium, 100 mg. for each kilogram of body weight, increased by about 400 per cent the dog's tolerance to cocain.

There was little more in the literature until Leshure, in 1927, reported the satisfactory results in 100 cases in which he had

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used barbital or sodium barbital before operating under local anesthesia. Later, Williams reported equally satisfactory results.

The ideal local anesthesia would be one which would give satisfactory anesthesia and at the same time leave the patient free from systemic action. But no such drug is known. The various synthetic anesthetics, such as salts of the ethanol (procain) and propanol (butyn) groups, are less dangerous than cocain, although they are not entirely free from danger.

Nielsen reports satisfactory results with the use of butylethyl barbituric acid (neonal) and adds that this compound has a marked margin of safety. Nielsen, Higgins and Spruth report, after comparative work on albino rats, that of all the barbituric acid salts, neonal is the most satisfactory.

Barbituric acid, $CO(NHCO)_2CH_2$, is derived from uric acid. The various compounds or salts are obtained by securing the diethyl barbituric acid salt and substituting the various radicals indicated. The compound commonly known as barbital is diethyl barbituric acid. Other compounds commonly used are phenyl ethyl barbituric acid (luminal) and n-butyl ethyl barbituric acid (neonal).

I have been administering two five-grain tablets one hour before operation, whether I intend to use cocain or novocain. Morphin may be given if desired, but it has not been found essential.

The patients are quiet and relaxed and are not apprehensive. The pulse is regular and full, and, except in an occasional instance of some unusually nervous patient, there is no evidence of cold, clammy skin or of fainting. After the patient has returned to his room the pulse remains regular and the patient rests comfortably.

Ewell reports equally satisfactory results in urology with the use of sodium barbital before local anesthesia. It would seem that when such large quantities of novocain solution are used, as in general surgery, the barbituric acid compounds are indicated, not only because of the severe symptoms of toxicity from local anesthesia in the nature of idiosyncrasy but because of the lesser symptoms which are, nevertheless, alarming and cause discomfort as well as delay.

CONCLUSIONS.

1. Inasmuch as there is an element of toxicosis in all local anesthetics, symptoms of varying degrees of severity are bound to occur.

2. The salts of barbituric acid have been found by animal experimentation to neutralize the toxic action of cocain and novocain in dogs and white rats and considerably increase the resistance.

3. The salts of barbituric acid have been found clinically to abolish the unpleasant symptoms of cocain and novocain poisoning in local anesthesia, eliminating such symptoms as collapse and pallor.

4. It has been found satisfactory to give 5 or 10 grains of sodium barbital or one and one-half grains of neonal by mouth one hour before operation.

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HIRAM SIBLEY BLDG.

XXXVI.

THE INCIDENCE OF EAR, NOSE AND THROAT DEFECTS IN LINCOLN SCHOOL CHILDREN.

By Earl B. Brooks, M. D.,

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Our examinations must of necessity be cursory ones—that is, each child is not subjected to examination with otoscope and nasal speculum. Otherwise we would not get over the whole system of 15,000 children in the allotted time. However, we do think we discover the majority of gross defects.

Chart 1 shows the outside of the health card we are using, on one-half of which is briefly recorded the childs name, age and health history. On the other half (Chart 3) is given the height-weight record.

Chart 2 and 2a show the reverse or inside of the pupil's health card, bearing the record, by years, of our examinations. At the bottom of Chart 2 and 2a is our code. "O" indicates no defect. "X," slight defect, as, for instance, X after tonsils might mean large tonsils, with some redness of pillars, some enlargement of the glands at the angle of the jaw, but the child in apparently good state of nutrition; no demonstrable cheesy débris in tonsillar crypts. X in the case of nasal obstruction indicates short upper lip, pinched nares, mouth breathing, whether from adenoids, deviated septum, turbinates or what not. (X) indicates a defect which is affecting unfavorably the health of the child. It is recommended that the physician or the specialist be consulted with a view to correction of the defect. (**X**) means a defect for which immediate correction is advised. R. O. indicates that a defect has been corrected.

Table 1 shows a summary of ear, nose and throat inspections by years, from 1919-1920 to 1924-1925, inclusive.

Nasal obstruction from all causes, both X and (X) is present in 16.7 per cent of cases. Tonsils X and (X) are present in 54.8 per cent, discharging ears and defective hearing in 2.4 per cent.

CHART 1.

P. & H. Ed., 1—8M—2-27

PUPIL'S HEALTH RECORD

H. R. _____ (in pencil)

I

Name _____ (Last) (First) (Middle)

Born: Year '19 Mo. 12 Day 30

Parent _____ Family Physician _____

II

Personal History (Dates when possible)

Diphtheria	Chicken-pox
Measles '23	Scarlet Fever
Mumps '22	Small-pox
Whooping Cough '25	Tonsillitis
Pneumonia	Typhoid
Frequent Colds	Meningitis
Deformities	Ear Ache

School Attendance

Elliott	1925
McKinley	1925
Prescott	1926
	19
	19
	19
	19

III

Schick Test 19 .. N.. P..

Toxin-antitoxin Treatment 19 27

Dick Test

Small-pox Vaccination 1927 not successful

RECOMMENDATIONS

DATE	Card	Call	DEFECT REPORTED	ADVICE	RESULT

CODE: Ex=excluded; N=notice; Spc=Special class; ⊗=defect corrected.

Department of Physical and Health Education, Lincoln Public Schools

CHART 2.

IV **Name** _____ (Last / First / Middle)

		19	19	19 25	19 26	19 27	19 28	19
	Date	Mo. Da. Hr.	Mo. Da. Hr.	Mo. Da. Hr.	Mo. Da. Hr.	Mo. Da. Hr.	Mo. Da. Hr.	Mo. Da. Hr.
					9 20	9 V4	11 V4	
	School and Grade	Pre-enroll't	Kdg.	Ell				
	Age							
V	Vital Capacity							
	Hand Grip R L							
	Vision R				16-20	14-20	20-20	
	" L				16-20	18-20	20-20	
	With Glasses R							
	" " L							
	Astigmatism R L B							
	Hearing R							
	" L							
VI	Conjunc. Trach.				O			
	" Follic			O	O	O	O	
	Ear				X	X	X	
	Nose			O	O		O	
	Adenoids				Q	Q	Q	
	Tonsils				Ro	Ro	Ro	
	Teeth			d	d	d	d d	
	Speech							
	Glands—Lymph				O	O	O	
	" Thyroid							
VII	Lungs							
VIII	Heart: P. bef. ex.							
	Heart: P. aft. ex.							
	Heart: P. aft. 3 m.							
	Heart: Rhythm							
	Heart: Murmur							
	Heart: Breathless.							
IX	Skin							
	Hernia							
	Nervous Cond.							
	General Nutrition							
	Posture, Shoulders							
	" Spine							
	" Abdomen							
	Foot R							
	" L							
X	Vigorous Ex.							
	Modified Ex.							

"o" indicates no defect; "x" minor; "(x)" recommend physician or specialist;

CHART 2a.

Home Room (in pencil) Deaf

Address (in pencil) _____

19 Mo. Da. Hr.	19 Mo. Da. Hr.	19 Mo. Da. Hr.	19 Mo. Da. Hr.	19 Mo. Da. Hr.	19 Mo. Da. Hr.	Mo. Da. Hr.	Remarks
							Checked for hearing. Ell
							Double dis-
							Charging
							Ears 1927-1928
							20 minute
							Rest periods 1927
							" " 1928
							M. D. 19...
							M. D. 19...
							M. D. 19...
							M. D. 19...
							M. D. 19...

"(x)" immediate correction advised

CHART 3.

PERMANENT HEIGHT-WEIGHT RECORD **Date of Birth**

YEAR	Ht. Sept.	Wt. Sept.	Wt. Oct.	Wt. Nov	Wt. Dec.	Ht. Jan.	Wt. Jan.	Wt. Feb.	Wt. Mar.	Wt. Apr.	Ht. May	Wt. May
19	42¾	42										
Aver.												
% Var.												
19..	47½	52½										
Aver.		52										
% Var.		0										
1926	49	60	59	60	61	51¼	64	63	63½	64		65½
Aver.		55					62					
% Var.		10+					+					
1927	54	65	67½	69	66	54	73	71	68¾	69¼	54	68
Aver.		71					71					71
% Var.		-10					over					-4
1928	55½	68¼	70	71½								
Aver.		75										
% Var.		-7										
19..												
Aver.												
% Var.												
19..												
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Aver.												
% Var.												

Record Overweights with "+" and Underweights with "−".

Table 2 shows a summary of the ear, nose and throat inspection report for the years 1925-1926 to 1928-1929, inclusive.

In the last column is shown the average of various defects over the ten-year period.

It shows nasal obstruction from all causes to be 6.7 per cent.

Granting that the cases in which the tonsils were marked "X," meaning slight defect, might vary with the individual observer and the clinical picture seen by the same observer at different times, this group, showing an average of 17.56 per cent, might for the sake of argument be disregarded. However, the group marked (X) or (**X**)—i. e., those in which we thought there could be no doubt that the tonsils were diseased and should be removed—is interesting, showing an average of 23.8 per cent.

There was an incidence of discharging ears of .32 per cent.

In regard to the cases of defective hearing, I wish to say that the whisper test is used by our nurses in taking the hearing acuity. The cases showing the gross defects are sent to me for more extensive examination and, if warranted, are recommended for the deaf room, where they receive training in lip reading. Defective hearing cases showed an average of .93 per cent, a smaller percentage than that reported by workers with the audiometer.

Tables 3 and 3a give detailed tabulation of ear, nose and throat defects shown in the individual schools, together with the totals for the school year 1928-1929.

In addition to the data incorporated in Table 2, it will be noted that the number of pupils who had had tonsillectomies was 3,358, or 23 per cent of the whole number examined. Of these, those showing a poor result numbered 175, or 5.2 per cent of the total number of tonsillectomies.

One of the things which led me to present this subject was the poor results following tonsillectomy. Some of these are:

1. Pieces of tonsil tissue of varying size at the base of one or both tonsillar fossæ. They used to tell us that a piece left at the base did no harm. It has seemed to me that (a) these pieces predispose to the formation of undue granulation tissue in the tonsillar fossa; (b) they stimulate the proliferation of the lingual tonsil; (c) they are often observed in conjunction with lateral or granulation pharyngitis.

TABLE 1.

REPORT HEALTH INSPECTION 1919-1920 to 1924-1925, INCLUSIVE.

Year	1919-1920		1920-1921		1921-1922		1922-1923		1923-1924		1924-1925	
Number Examined	8,164		10,746		10,286		11,121		12,648		11,959	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Nasal Obstruction	x				64		123		84		266	
	(x) 922	11.2	713	6.6	736	7.7	655	7.	397	3.7	1741	16.7
Diseased Tonsils	x		1247		520		395		2068		2483	
	(x)2199	26.9	4049	49.	1281	18.4	1406	16.1	3828	46.6	4082	54.8
Discharging Ears			18		30		24		22		43	
Defective Hearing	152	.18	50	.6	72	1.	78	.7	152	1.3	241	2.4

TABLE 2.

REPORT HEALTH INSPECTION 1925-1926 TO 1928-1929, INCLUSIVE.

Year	1925-1926		1926-1927		1927-1928		1928-1929		Average 1919-1929
Number Examined	10,999		12,367		13,878		14,035		
	No.	%	No.	%	No.	%	No.	%	
Nasal Obstruction	358	3.2	239	1.9	718	5.1	571	4.06	6.7 %
Adenoids	1634	14.8	992	7.1	1346	9.7	1521	10.8	
Diseased Tonsils (X)	2459	22.3	3346	27.	3531	25.4	3606	25.7	17.56%
Diseased Tonsils (X) (X)	3167	28.8	1821	14.7	2903	20.9	2729	19.4	23.8 %
Lymph Glands	3337	30.3	6315	51.	4637	33.4	3952	28.2	
Discharging Ears	52	.47	38	.3	56	.4	31	.22	.32%
Defective Hearing	169	1.5	128	1.	93	.66	124	.88	.93%

TABLE 3.

	Bancroft	Belmont	Bethany	Bryant	Capitol	Clinton	Elliott	Everett Jr. High	Hartley	Hawthorne	Hayward	Huntington	Irving Jr. High I	Jackson	Sr. High School
Number Examined	330	250	398	340	391	727	761	507	475	150	574	386	929	367	2052
Nasal Obstruction	35	18	16	23	17	8	18	16	24	10	29	20	31	0	0
Deviated Septa		8	5		1	4	7	11			4	0	18	2	17
Diseased Turbinates		0	0			1						0	0	9	0
Adenoids	74	58	59	38	52	103	114	33	89	26	106	81	15	14	1
Defective Tonsils—Total	170	158	115	172	230	367	423	250	276	97	242	196	389	140	985
Defective Tonsils X	90	84	25	101	126	145	208	190	124	42	120	113	265	68	793
Defective Tonsils (X) **(X)** Tonsillectomy Indicated	80	74	90	71	104	222	215	60	146	55	122	83	124	72	192
Defective Tonsil Red O-Cases having had Tonsillectomy	32	13	45	55	126	146	174	57	132	51	51	79	387	82	631
Defective Tonsil ½ Red O-Tonsillectomy—Poor Result	3	2	4	2	3	12	8	2	4		2	6	23	11	8
Sinusitis—Total	4	0	11	0	4	2	10	3	0		7	0	24	3	0
Red O with Sinusitis, i.e. after Tonsillectomy	3	0	0	0	0	17	0	0	0	0	1	0	19	0	0
Lymph Glands	129	130	43	123	181	261	227	126	213	92	78	153	244	64	0
Discharging Ears	0	0	1	0	0	2	2	1	0	0	0	3	2	0	5
Defective Hearing	1	0	0	3	1	5	1	6	1	5	31	5	31	2	13

TABLE 3a.

	Lakeview	Longfellow	Normal	Park	Prescott	Randolph	Riley	Saratoga	Sheridan	Jr. High, 26th and O	Jr. High, Whittier	Willard	Van Fleet	Total, 1928-1929
Number Examined	43	261	116	780	724	435	145	717	402	370	1126	86	202	14,035
Nasal Obstruction	1	7	12	13	58	18	12	42	12	0	12	3	4	571
Deviated Septa	0	14	0	4	1	0	0	2	0	4	0	0	0	102
Diseased Turbinates	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Adenoids	5	62	17	130	136	43	19	125	36	7	25	21	32	1,521
Defective Tonsils—Total	12	120	52	309	325	113	61	366	114	75	455	48	80	6,335
Defective Tonsils X	0	67	33	172	150	62	35	183	65	22	252	31	39	3,606
Defective Tonsils (X) (X) Tonsillectomy Indicated	12	53	19	137	175	51	26	183	49	53	203	17	41	2,729
Defective Tonsil Red O-Cases having had Tonsillectomy	5	21	25	133	258	141	30	169	184	94	257	13	67	3,358
Defective Tonsil ½ Red O-Tonsillectomy—Poor Result	1	0	1	1	17	10	1	16	8	14	13	0	3	175
Sinusitis—Total	0	0	1	0	3	1	0	7	4	0	4	2	0	90
Red O with Sinusitis, i.e. after Tonsillectomy	0	0	0	0	0	0	0	6	2	0	8	0	0	56
Lymph Glands	6	119	38	309	276	90	43	323	113	125	340	44	62	3,952
Discharging Ears	0	3	0	0	3	2	0	2	1	2	2	0	0	31
Defective Hearing	0	1	0	13	15	0	0	3	3	3	9	2	1	124

2. A piece of tonsil tissue left in one or both supratonsillar fossæ. I have repeatedly observed cheesy débris in these bits of tonsil, and the glands at the angle of the jaw on that side of the throat enlarged, while on the side of the throat from which the tonsil had been cleanly removed the cervical glands were not palpable. It goes without saying that we feel the tonsil should be thoroughly removed.

3. Cases in which the tonsil has been completely removed but instead of a smooth fossa, granulation tissue is present varying from a pea-sized nodule to one the size of an almond or larger, this condition is often observed in connection with lateral and granular pharyngitis. Pratt[1] believes this excessive granulation tissue is due to infection of the fossæ and that it occurs more frequently in adults. I have seen it fairly frequently in children under 12 years of age. Roberts[2] states that the reappearance of lymphoid tissue in the fossa is the result of traumatism at operation.

4. Injury to the soft palate—

a. Trauma to the pillars resulting in a puckering string effect at the superior pole distorting the soft palate.

b. Trauma to the pillars at the lower pole, producing contraction and drawing up of the base of the tongue.

c. Snaring of the uvula.

d. Snaring of the uvula plus sufficient trauma to the pillars to produce a taut, inelastic fibrous tissue curtain imperfectly separating the naso- and the oro-pharynx. This condition is one of a number furnishing a basis for the popular belief among the laity that tonsillectomy has an adverse effect upon the singing voice.

Another condition observed is the finding in children who have had an apparently good tonsil and adenoid operation of one or more of the following: (1) a runny nose; (2) crusting and excoriation of the anterior nares; (3) purulent mucus on the posterior pharyngeal wall or hanging down from the soft palate; (4) enlarged cervical glands. These we have reported as sinusitis and recommended follow up.

Diseased tonsils and adenoids are the prevalent defects found in the younger children, while many of high school age either

have tonsils which apparently are not affecting their health, or have had a tonsillectomy. These are of proper age to have septal deflections corrected and in cases producing obstruction we encourage them to have this done.

In conclusion, I wish to make a plea for (1) more careful and painstaking tonsil work; (2) a more careful follow up of all our operative work, as this often marks the difference between satisfactory and unsatisfactory results.

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XXXVII.

TREATMENT OF DACRYOCYSTITIS FROM THE VIEWPOINT OF THE RHINOLOGIST.*

By Arthur C. Jones, M. D.,

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The operation of extirpation of the tear sac is a very satisfactory one, from a surgical standpoint, and so is the removal of the inferior turbinate a satisfactory surgical procedure; but today there are very few rhinologists who will consent to remove an inferior turbinate. In both these operations, the after-results are far from satisfactory. In the extirpation from 30 to 50 per cent have epiphora. I am quoting from a recent telegram received from Dr. Mosher of Boston. He states, "Tearing after excision of sac in 30 to 50 per cent." About 90 per cent of the people that have had their inferior turbinates removed regret the operation the rest of their lives.

I have done the usual number of extirpations that a fairly busy ophthalmologist and rhinologist does. I was not duly disturbed about the complaints that were made to me in regard to epiphora. I told most of my patients that they were better off than before the operation and that their epiphora was not dangerous to the eye. Unfortunately, or perhaps in the end fortunately, I had done an extirpation on a hospital superintendent. I still have the most vivid picture of her in my mind. Every morning she seemed to be waiting for me, and there she stood dabbing at her eye. Occasionally her greetings were not altogether pleasant.

I had seen Dr. West demonstrate his intranasal tear sac operation in London in 1914. It seemed somewhat risky and uncertain, and did not appeal to me at the time, but later the persistence of epiphora in my own tear sac extirpations caused me to decide that if there was an operation that would be more certain of relieving epiphora than the extirpation, I was going to master its technic.

*Presented before the Western Section, American Laryngological, Rhinological and Otological Society, Victoria, B. C., January 17, 1929.

At the Academy meeting in Minneapolis in 1922, I heard Dr. Mosher's paper on reestablishing intranasal drainage of the lacrimal sac. At that time he reported very excellent results in about 25 cases. Two years later, while taking Dr. Mosher's course in Boston, I saw him do a number of operations on the living, and the same was demonstrated on the cadaver, as a part of the course. The Toti-Mosher operation is not more difficult than the extirpation, and Mosher's end-results were far more satisfactory.

HISTORY OF THE OPERATION.

Research shows that an attempt to reestablish an obliterated or morbid passage from the lacrimal sac to the nasal cavity was first made a very long time ago, in the age, in fact, of Galen himself; for he proposed to break through the lacrimal bone and introduce a caustic substance so as to prevent a closure of the new formed nasal passage. The milder measures assigned to Celsus—that is, the destruction of the sac by means of a caustic without an attempt to communicate with the nose—has been preferably followed and is employed by some to this day.

Even when the anatomy of the parts came to be more carefully studied in the days of Vessalius and Follopius, no new methods were proposed for the treatment of abscesses of the sac, and it was not until 1700 that probing and irrigation were first recognized.

In 1904 Circinione first performed on the living subject an operation which he had described and carried out successfully on the cadaver. He isolated the sac with the canaliculi, but preserved it carefully in situ, bored an aperture through the nasal process of the superior maxilla just anterior to the lacrimal ridge, made sure of its freedom of communication with the nose, and through the bony canal thus constructed he pushed the lower portion of the sac. In this way he was enabled to form and retain a perfectly sufficient drainage route for the lacrimal apparatus, and the patient was much relieved.

In 1909, in the Ophthalmic Review, there appeared a description of Toti's (of Florence, Italy) operation for the treatment of dacryocystitis. This consists of cutting down to the

inner side of the orbit close to the inner margin of the sac, removing the portion of the inner posterior wall of the sac, turning back the periosteum and working one's way through the ethmoid cells to the nasal cavity. A portion of the nasal mucous membrane, at least equal to the opening in the sac, is now removed. It may be necessary in some of the cases to remove part of the turbinate bone before one can be certain of obtaining a permanent and sufficient tunnel. The plan has at least the advantage that the drainage of the conjunctiva will be as nature originally intended, even if the new passage does not exactly correspond with the old situation. At the time of publishing his pamphlet Toti had carried out his plan in over forty patients and was more than satisfied with the results obtained. Since then the literature has contained many modifications of Toti's operation.

In the October Journal of Ophthalmology, 1928, J. J. Corbett reports the Dupey-Dutemps and Bourquet technic for plastic dacryorhinostomy, which consists of direct anastomosis of the lacrimal sac with the nasal mucous membrane. In 1925 Dupey-Dutemps stated that up to date he had done about 500 operations with total relief from epiphora and pus in 97 per cent of all cases. For the most part the cure and treatment of epiphora and dacryocystitis will be in the hands of the ophthalmologist.

I have just reviewed several of the best known operations for reestablishing nasal drainage of the lacrimal sac. Certainly if extirpation was as successful as some ophthalmologists infer, there would be no occasion for so much time and work being spent in perfecting a better operation.

J. J. Corbett, in his review of the Dupey-Dutemps operation, states that in tear sac surgery of today there are two distinct objectives: the operation must relieve and prevent the recurrence of the infection, and it must banish for all time that ever-present and most annoying concomitant disturbance—epiphora. If an operation on the lacrimal drainage apparatus will not accomplish this twofold purpose it should not be given a place in present day ophthalmic surgery; in this I heartily agree. He also states that simple extirpation of the sac as a remedial measure in cases of chronic dacryocystitis is ob-

solete. As a surgical procedure, it is inadequate. It removes the infection, but in a large percentage of cases it fails to correct that most troublesome feature which is of all importance to the patient—that is, the constant overflow of tears. I think he should also have stated that the operation should be simple enough to perform so that any well trained ophthalmologist or rhinologist could easily master the technic.

The operation that I have been doing for the past four years is Mosher's modification of Toti's, and it has answered all of the above requirements. In twenty-two cases the results were entirely satisfactory, with but two exceptions. Fourteen of the patients were operated on for chronic dacryocystitis and eight for persistent epiphora. The ages ran from 15 to 71 years. All were done under local anesthesia with the exception of one case. The time consumed in the operation varied from one hour and fifteen minutes, the first one done under general anesthesia, to thirty-five minutes for one of the later ones done under local anesthesia. The bleeding is not troublesome under local, especially if the lips of the wound are widely separated by a sac retractor.

Cultures: Cultures of pus in the sac previous to operation showed a mixed infection with the pneumococcus predominating.

In a rather close follow-up, two out of fourteen cases done for dacryocystitis report some epiphora when out in the wind but no trouble when reading or doing housework. The ten done for epiphora all state that there is no excessive overflow of tears.

Scarring: This was noticeable in only one case. I use dermal for suturing and remove the sutures along with the external dressing on the third postoperative day. There were no postoperative fistulæ. Four cases showed pus around the sutures for a few days.

Persistence of epiphora: In some cases there was no evidence of excessive tearing on the third day, and fluorescein dropped in the eye quickly appeared in the nose; others had varying amounts of epiphora up to sixteen days. None of the cases were probed or irrigated.

Nasal packing: At first I allowed the packing to remain in the nose for forty-eight to seventy-two hours, but lately I have removed the packing at the end of 24 hours.

Intranasal work: The anterior ethmoids were curetted and the tip of the middle turbinate was removed in all of the cases and a careful effort made to remove all fragments of mucous membrane. A submucous was done in only one case.

Previous history of cases: Pus was present and easily expressed in thirteen, seven had had repeated attacks of dacryocystitis and had to have abscesses incised. Two cases had fistulas present at time of operation, one of two years' duration, the other three weeks' duration. The canaliculus had been slit in two cases before operation. Five gave a history of having had the lacrimal tract probed before operation.

Condition of nose: Sixteen cases were clinically negative, three showed clouding of ethmoids on side involved, with pus in the middle meatus. One had atrophic rhinitis, one an infected antrum. In one case there had been an attempt made to excise the sac.

In one case there was a phlegmonous inflammation of the sac, with a hard brown infiltrated area below the eye; no pus could be expressed from the punctum; there was great pain and one degree of temperature.

I have been taking cultures in all postoperative cases that I could get to come to my office during the past two months. In four, cultures from both conjunctival sacs were negative. In four, staphylococcus was present in both eyes. It is interesting to note that in those cases where the culture was positive in the operated eye the same organism was found in the fellow eye with an apparently normal lacrimal apparatus. Pneumococcus was absent in all cultures.

OPERATION.

I have followed Dr. Mosher's technic as near as possible in my operative procedures with the exception that, instead of using ether, I use novocain injection; infiltrating along the line of incision and then using the same injection that Dr. Sewell uses for his ethmoid operation (that is, injecting above and below the inner canthus and following down the inner wall of the orbit, being careful not to use too much of the solu-

tion). I also pack the nose with 20 per cent cocain and adrenalin. I have not found it necessary to put in a postnasal pack because of the small amount of bleeding.

First step: "The lid of the eye involved, the eyebrow and upper part of the nose are cleansed in the usual manner. The lids are held together and the cornea protected from accidental trauma by keeping the lids closed by strips of sterile adhesive, pasted from the upper to the lower lid. If there is an obstructing deviation of the septum high up it is better to resect this portion of the septum, as a part of the first step of the operation, or to do it before the tear sac operation is undertaken. The anterior tip of the middle turbinate may be removed under cocain a few days before the operation on the sac or as a first step of the operation.

"Second step: The second step of the operation is the exposure of the lacrimal sac, freeing it from its bed and turning the sac and the adjacent soft tissues outward. The sac is approached through an incision over the ascending process of the superior maxilla. The incision is made about 10 mm. from the inner canthus of the eye. It starts at the level of the crease in the upper eyelid which marks the upper limit of the cartilage of the lid, and runs down in a nearly straight line and parallel with the posterior edge of the ascending process of the superior maxilla, where this makes the anterior boundary of the bed of the sac. The incision is stopped two or three mm. below the inner limit of the lower rim of the orbit. The whole length of the skin incision is outlined first. Then the knife is carried through the soft tissues and the periosteum to the bone. In freeing the sac from its bed and in elevating the periosteum from the inner wall of the orbit a flat chisel about a quarter of an inch wide is employed. It acts both as a sharp and blunt elevator. At times it is necessary to supplement this by the knife, especially about the anterior edge of the bed of the sac. The sac shells out of its bed most easily if it is approached from above. Accordingly the elevation of the periosteum of the inner wall of the orbit is begun just above the sac and then carried downward until the sac is thoroughly out of its bed and the beginning of the nasal duct is clearly seen. As the sac is being freed from its bed the elevation of the periosteum of the inner wall of the orbit is carried back a little—that is,

for two or three mm. beyond the crest of the lacrimal bone. By working in the manner outlined it has so far been easy in all cases to define the limits of the sac, regardless of the presence of fistula and of previous attempts at excision.

"If the sac does not present clearly, a slight enlargement of the incision upward readily brings it fully into view. If, however, the incision is carried upward to any great extent it will be found, when it comes to suturing the wound, that a dead space has been created in the soft tissues at the upper end of the incision which requires a buried suture to obliterate it. In some of the earlier cases a nondraining pocket was formed, which made it necessary to open the upper part of the incision.

"Third step: The third step in the operation is to make a bone opening into the nose which at least equals the height and width of the sac, unless the sac is excessively dilated. The bone opening, however, must be made large enough to receive easily the outer wall of the sac after the inner half or two-thirds have been cut away.

"The initial opening into the nose is made by breaking down the lacrimal bone in front of the crest. This is readily accomplished by the end of a small punch. A sufficient opening is made in the lacrimal bone to permit the introduction of the smallest Kerrison punch or any similar instrument, like that of Citelli. With this the rest of the lacrimal bone in front of the crest is bitten away, and then the posterior edge of the ascending process of the superior maxilla where this makes the anterior half of the bed of the sac is removed. As was said above, the bony opening into the nose must at least equal the height and width of the sac. This accomplished, the inner bony wall of the nasal duct is bitten away with a small punch (Lang's) to the level of the upper rim of the inferior turbinate.

"Fourth step: The fourth step of the operation consists in the removal of the inner half of the wall of the sac, or, if the sac is greatly dilated, of the inner two-thirds. In addition, the inner wall of the nasal duct is removed. The removal of the inner half of the wall of the sac is accomplished with forceps and scissors, the removal of the inner wall of the nasal duct with a small punch. It is essential, of course, to leave the outer half of the sac, because in this, at the level of the inner canthus, the common opening of the canaliculi is placed."

In distended sacs this opening is never endangered, but care must be taken in cases where the sac is small. The mucous membrane of the nose is sacrificed where it presents in the bone opening and trimmed flush with the margin. The region of the nose opposite the bone opening and into which from now on the sac is to drain is made free from tags of middle turbinate and overlapping ethmoid cells. This is done in order that the granulations which occur during the healing process may not obliterate the new opening, in case this is surrounded by granulations caused by the suppuration in the sac.

After replacing the soft tissues the skin is sutured and no attention is paid to the underlying periosteum.

The operation is completed by freeing the nose of clots. I always suture the entire incision with dermal, regardless of the amount of pus in the sac. Pressure is produced upon the incision and the soft parts below by a truncated dressing over which a pressure bandage is applied.

After-treatment: The pressure bandage is kept on for three days, being removed temporarily for washing the eye with boric solution.

Dr. Mosher has modified Toti's technic by making a skin incision straight and 10 mm. from the inner canthus. The first opening is made through the lacrimal bone, not through the thick bone of the superior maxilla. Toti goes to great pains to save this mucous membrane intact, before he makes the opening through it. This Dr. Mosher disregards, resecting it along with the bone. Toti does not remove the wall of the inner duct, and in Mosher's operation this is removed down to the upper rim of the inferior turbinate. Toti occasionally removed the tip of the middle turbinate; Mosher does it in all cases. He feels that it is vital to get a maximum amount of space in the anterior part of the meatus.

Contraindications: So far as I know, there is only one contraindication to the Toti-Mosher operation, which, by the way, applies equally to the extirpation. That is, where there is stenosis of the common duct of the canaliculi at its entrance into the sac. The patency should be determined either by passing a lacrimal probe or by the use of lipiodol diluted with equal parts of olive oil and obtaining a radiogram.

CONCLUSIONS.

In reviewing the results obtained by extirpation of the sac, it is evident that there has been considerable dissatisfaction caused by the high percentage of cases in which epiphora persists. While with the Toti-Mosher operation the percentage of epiphora is much reduced. Quoting again from Dr. Mosher's telegram: "Tearing after excision of sac 30 to 50 per cent. Tearing after Toti-Mosher operation 10 to 15 per cent. At our infirmary the ophthalmologists rarely excise a tear sac now."

The postoperative cultures that I took were all negative for pneumococcus, which previous to operation had shown a preponderance of this organism. The conjunctiva is free from infection in a very short time, and operations on the globe could be done as quickly and as safely as in extirpation.

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XXXVIII.

OTOLOGIC COMPLICATIONS FROM SWIMMING IN SUMMER CAMPS: AN ATTEMPT AT PREVENTION.*

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During the past few years increasing emphasis has been placed upon the condition of the individual patient as an etiologic factor in otologic complications following swimming. Skillern[1] stressed this point in 1922, discussing Fenton's[2] instructive paper on "Sinusitis from Swimming." Taylor[3] has pointed out man's lack of adaptation to aquatic habits and the necessity for understanding the limitations Nature has placed upon him. Fenton,[4] in his later work on "Otorhinologic Pathology of Swimming," paid particular attention to the personal factors which render certain individuals vulnerable to these complications. During the past ten years we have had the opportunity of following quite a number of these complications in summer camps for boys and girls. Considering the number of students and the amount of swimming done, the number of cases has never been large, but each year there have been a few which were quite severe. In reviewing these cases it would seem that each presented certain features pointing to some preexisting pathologic condition, which might have been prevented, if recognized and proper precautions taken. One especially tragic case has been selected for brief presentation.

L. E., age 12, was admitted to the Sisters' Hospital, July 30, 1927; dull and stuporous, with a temperature of 103.6, and pulse of 130. Three days before, while at camp, he had developed pain in the left frontal region. This was at first attributed to a gastrointestinal upset by the camp physician. The day prior to admission his left eyelid became swollen. That night his temperature, which had been normal, was 104.4.

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On admission there was marked exophthalmos and chemosis of both eyes, more marked on the left. There was tenderness over both frontals. Examination of his nose showed pus in the left middle meatus, none on the right side. Throat showed small apparently innocent tonsils, with considerable postnasal discharge. His reflexes were all normal, although there was a question of slight stiffness of the neck. Urine negative. He had a leucocytosis of 20,000, with 80 per cent polymorphonuclears. Heart and lungs were found essentially negative by Dr. J. O. Piper. Ophthalmoscopic examination by Dr. H. F. Hill showed "Hyperemic discs, due to toxemia, possible beginning neuritis." X-ray showed "diminished radiability of both frontal sinuses and of left antrum, probably containing pus. Heart, lungs, mediastinum and diaphragm normal." Temperature that evening was 105° rectal, and he was delirious. Next day his white count was 28,000. His neck became definitely rigid and he developed a positive Kernig. No change was reported in the fundi. Lumbar puncture showed a slightly cloudy fluid under normal pressure, as recorded by the mercury manometer, with a cell count of 12,000, 78 per cent being polymorphonuclears. Temperature did not go below 105, finally reaching 109.4° before death on the third day. On this day the exophthalmos was less marked and seemed to be receding. Blood culture, taken on admission, showed a growth of short chain streptococci after 48 hours.

From the picture of extreme sepsis, of sudden onset, marked exophthalmos and chemosis, involving first one side and then the other, and the signs of meningeal involvement, there seemed to be no doubt as to the diagnosis of acute fulminating obliterating cavernous sinus thrombophlebitis, according to Eagleton's[5] classification. Unfortunately it was impossible to obtain permission for an autopsy. The evening before he died his parents arrived from New Jersey by airplane, and from them I obtained a history of frontal sinus infection, with several exacerbations during the preceding five years.

Here we had the case of a boy with a preexisting pathologic condition such as to absolutely contraindicate aquatic activities, daily indulging in swimming and diving. The camp was hardly to blame. Nothing of this sinus history had been noted in the report from the boy's family physician. The examination by

the camp physicion, who, of course, was not trained in rhinology, failed to disclose evidence of trouble. This case was so tragic that it made a marked impression upon me. It seemed that it might be worth while to study the situation as it existed in these camps, with a view of possibly eliminating the cases presenting such obvious hazards. Although this subject has been thoroughly covered by the scientific work of Taylor, Fenton and others, it seemed that these camps presented an especially valuable field for clinical study. While it was realized that this would be necessarily limited in its scope, it was felt that it would be justified by the advantage of having a controlled group of sufficient size to be of value, with the possibilities of accurate follow-up. In order that we might be assured of the necessary cooperation, this investigation was confined to selected camps of the highest grade.

These summer camps are composed of boys or girls of from 6 to 18 years of age, the average being 15. Most of them come from our large cities in the East and Middle West. Consequently they are not especially acclimated to Maine weather or to life in the open. July and August are spent at camp. They live practically outdoors, either in tents or cabins, and hence are not subject to the drying effect of artificial heat on the respiratory mucous membranes. Their dietary is excellent, and there is little opportunity for indiscretions leading to gastrointestinal upsets. They live under a semi-military discipline, not severe enough to be burdensome, but sufficient to insure proper control and at the same time to hold their interest. All the camps are well provided with proper supervision for the students. The average ratio of councillors to students was 1 to 4.

Loss of health in any degree being such a liability to a camp, the physical condition of the students becomes a source of greatest concern to the camp authorities. All but three camps had one or more licensed physicians, devoting their whole time to the health of the students and the sanitation of the camp. Most of the camps had graduate nurses as well. The three without resident physicians had especially competent nurses, of judgment and experience; and employed the services of a physician practicing in the vicinity. All students bring a report of their physical condition, made out by their family

physician. On entrance a routine physical examination is done by the camp physician, who also keeps an active supervision of the student's physical condition at all times. These camps have facilities for immediate dispensary care of patients, but send all serious cases to hospitals, which are easily available.

They also have the services of such consultants and specialists as may be needed. In Maine all summer camps are under the supervision of, and are regularly inspected by, the State Department of Health. I think it is safe to say that many of these young people have better care and are under more accurate supervision while at camp than at home.

In all, fourteen camps were studied. One had separate divisions for younger and older boys, and one was divided into a boys' camp and one for girls. All were situated upon lakes in Central Maine, mainly in the Belgrade region.

Bacterial count of samples of water taken from the different camp sites showed considerable variation. Of course, no definite conclusions can be drawn from these examinations. Repeated examinations of samples taken from different depths would be necessary in order to be of any real value. As was expected in such large bodies of water with rocky shores and absence of sewerage contamination, the counts were low. The one exception was from a lake in which, for the first time, last year there appeared a considerable amount of a green fungus growth. This showed a count of 1,650. Fenton[2] has pointed out that the germs of vegetable decay, such as thus found in water, is of little significance in regard to swimming complications.

The results of the bacterial count was as follows:

Bacterial Content per cc. of Water.—Camp A, 76; Camp B, 22; Camp C, 109; Camp D, 1,650; Camp E, 290; Camp F, 180; Camp G, 161; Camp H, 3; Camp I, 200; Camp J, 320; Camp K, 116; Camp L, 76; Camp M, 13; Camp N, 320.

Swimming is one of the main features of camp life. All members of the camps go in daily unless excused or restricted for some physical reason. It is all under careful and constant supervision. Every camp has one or more competent instructors. The amount of swimming is carefully regulated. This varies somewhat in different camps, depending upon the age

and sex of the students. Dr. E. L. Swan, who has had years of experience at the head of a boys' camp, feels that one of the greatest causes of trouble from swimming is too lengthy indulgence, and limits his boys to one one-hour swim per day. This agrees with the observation of Taylor[6] regarding the importance of fatigue as a factor.

It was found that practically all types of swimming were taught and practiced, depending, of course, upon the age and experience of the students. Some of the instructors did not employ the Australian crawl but all did use the American crawl. This is merely a technical difference. Contrary to the opinion of Fenton, in this series at least, the type of swimming did not seem to make any difference as regards complications. All instructors, however, insisted upon proper breathing, agreeing that this was perhaps the main factor in avoiding trouble. With the crawl the student is taught to inhale only through the mouth and on a certain count (usually 4), when the head is turned to one side. Diving is especially watched and restricted to those who are sufficiently experienced to practice it with safety. Stunt swimming or attempting to "show off" in the water is frowned upon. One instructor expressed himself as especially opposed to submerged swimming and plunging for distance.

The total number of cases studied was 1,235. The procedure was as follows: Early in the season each camp was visited and the students examined. All examinations were done by the writer. This was in an endeavor to have a uniform standard throughout, especially in classifying those cases which might be considered as hazards. A short history relative to previous illness, operations, and ear, nose or throat troubles was taken; and the ears, nose and throat were examined in each case. Cerumen was removed when present and especial attention was given to the condition of the middle ears. The presence of adenoids, infected tonsils, or a nasal discharge was noted. These findings were recorded upon forms provided for the purpose. Certain cases were classified as absolute hazards and restricted from all water activities. Others were limited as to diving and the amount of swimming. At the close of the season a blank report was sent to each camp physician, which he filled out and returned to the writer. On this was checked

every case of ear, nose or throat trouble, no matter how trivial, giving the diagnosis, etiology, duration and outcome. This was compared with my own records of the cases serious enough to come under my own attention.

The results were surprisingly gratifying. Out of the 1,235 students there were only four cases of acute otitis media, a percentage of .32. The one serious case was a boy who was sent to camp after the season opened, convalescent from measles. He had been certified by his family physician as in condition to attend camp, and unfortunately he was allowed to swim. This case really should not have been in camp, let alone in the water. It represents the one real "leak" in the season. The other three cases were in boys who had been in swimming with acute head colds. All had had tonsil and adenoid operations, but two of the results were poor. All subsided promptly after incision of the membrana tympani.

While the number of cases of ear complications from these camps has never been large, these figures were considerably lower than those of previous years. The main feature, however, was the absence of the severe type of case with its resulting worry. While other factors, such as the weather and general health of the students, might have played a part in this, there was about the usual number of ear complications from these same lakes, excluding these camps, during this period. And these other cases did not do nearly as much swimming as the camp cases.

There were five cases either seen or reported of slight temporary pain or feeling of stuffiness in the ear, promptly subsiding, which were classified as salpingitis. Considering all cases with any symptoms referable to the middle ear, we have a percentage of .7. This does not include three cases of otitis externa, one being in a girl with a chronic eczema of the canal.

There was one case of acute frontal sinusitis in a young boy following a severe grippe infection, which subsided after a few days in the hospital. We could not prove the direct influence of swimming in this case, as his grippe had prevented him from swimming for several days prior to his sinusitis. A few cases of tonsillitis were reported, while there was one case of acute laryngitis, seen in a camp cheer leader. Here it seems probable that vocal abuse rather than swimming was to blame.

Of the 1,235 cases studied, 116, or 9.39 per cent, either gave a history or evidence of old otitis media. Thirty-two, or 2.59 per cent, had had mastoid operations, one being radical. Twenty-eight either gave a history or showed evidence of sinus infection. Eleven gave a history of vasomotor rhinitis. Sixty-nine had sufficient septal deviation to be at least moderately obstructive. The total percentage of the nasal cases was 8.7.

Nine hundred and fourteen, or 74 per cent, had had tonsil and adenoid operations. In 217, or 23.7 per cent, the results were obviously poor. Ninety-nine, or 7.1 per cent, had enlarged and infected tonsils or adenoids, or both, sufficient to warrant operation.

Although it has been estimated that tonsillectomies comprise one-third of all operations in this country, the large number who had been subjected to this operation was indeed startling. To one somewhat conservatively inclined this would seem, at first thought, altogether too high. There was no way of justifying this opinion, but the number showing obviously poor results would make one doubt the diagnostic ability of the operators in these cases. Of course, one might attribute the small number of complications to the large number previously tonsillectomized. On the other hand, 321 had not been so operated upon, and none of this group had any trouble. Ninety-nine of these, however, because of obviously diseased tonsils or adenoids, were somewhat restricted in their water activities. Certainly it is hard to believe that the imperfectly operated cases were made any safer by this procedure. According to the investigations of Rhoads and Dick,[7] these remnants or "stumps," show a higher bacterial content and are of more menace than the virgin tonsil. Two hundred and seventeen cases showed significant remains of tonsils or adenoids or both. Of this number there were two cases of acute otitis media and one of salpingitis. Of course, the number of complications is too small to arrive at any conclusions in this regard, so we are simply left with the rather amazing number of cases having been tonsillectomized and a lingering doubt as to the necessity in every case.

The pathology of these swimming complications has been thoroughly covered by Fenton and Taylor, and it would be

inappropriate to attempt to go into it here. Suffice it to say that we felt that the camp routine and the purity of the water pretty well eliminated the extrinsic factors. This left us with the personal factors, mainly those of already existing pathology. The possibility of carrying infection from a nasal or pharyngeal focus to the middle ear, via the eustachian tube, and the disastrous effect of water immersion on radical cavities or perforated ear drums indicated the wisdom of restriction in these cases.

Four hundred and fifty-one, or 36.5 per cent, were considered as presenting possible hazards from swimming. These were cases which either gave a definite history or clinical evidence of otitis media, of sinusitis, vasomotor rhinitis; who had adenoids or sufficient tonsillar tissue to be a menace; and those with high narrow noses, impinging turbinates and obvious deflections, considered by Fenton as dangerous risks.

Sixteen of these, or 1.29 per cent, were classed as absolute hazards, and were advised against immersing the head under water at all. These included twelve cases showing a purulent nasal discharge, indicative of sinus infection, one radical mastoid, and three cases of chronic suppurative otitis media. The elimination of these cases, which seemed to be potential sources for serious complications, was the first and most important step in the way of precautionary measures.

One hundred and thirty-eight, or 11.17 per cent, who presented less hazardous conditions, were placed under partial restriction. In this group were classified all cases showing significant amounts of adenoids, obviously diseased tonsils, especially those giving histories of recurrent sore throats, obstructive septa, impinging turbinates, old otitis media, with or without mastoid operations which showed perforations or thin cicatrices in the membrana tympani, and those giving a definite history of vasomotor rhinitis, asthma or sinus trouble when from examination clinical evidence of the same could not be made out. The limitations depended upon the condition of the individual case. Diving was usually advised against, especially in the old otitis media cases, with tonsillar or adenoid remnants. Those with old perforations, if allowed to swim, were to protect the ear with cotton moistened with oil. The attention of the camp physician was directed to the individual features in

these cases. The occurrence of a nasal or postnasal discharge was especially to be watched for in a case with a sinus history. Swimming was to be forbidden during any active phase of a vasomotor case. With the exception of two cases of mild salpingitis, no difficulties were encountered with this group. This speaks well for the type of medical supervision in these camps. The writer does not wish to take all the credit for these precautions. In many cases they were already instituted by the camp physician, acting on data obtained from their histories. In several incidences, restrictions already in effect were relaxed or done away with, when it was found that they were uncalled for.

The other 297, or 24 per cent of the total, were not subjected to any restrictions. The camp physicians were cautioned to keep close watch on these and see that they were especially careful about management of water which might enter their nasal cavities. This group included the suspicious tonsil cases, those showing poor results from tonsil operations, and cases of otitis media or mastoiditis, in which there had been good healing in the middle ear.

Of course it was neither necessary nor wise to carry these restrictions too far. Swimming was the main sport at these camps. It seemed best to judge each case on its own individual merits and to allow all the liberty consistent with safety. The limitations placed upon the second group were based upon personal judgment, and, although the results were quite satisfactory, may be justly subject to criticism.

Two of the cases of otitis media came from the unrestricted group. They were in young boys who had the remains of tonsils, from rather poor operations. The other two were from the group not considered at all hazardous. One was the convalescent measles case, before mentioned, a plain slip-up. Two of the salpingitis cases were in the limited group, one in the unlimited group and the other two in the nonhazardous group. All these cases, with the exception of the convalescent measles, were due to swimming with head colds, always the greatest cause of such troubles at these camps. Incidentally two of the cases of salpingitis were in councillors and another was in a camp physician. One of the swimming instructors was found to have a perforated ear drum, the result of stunt diving prior

to coming to camp. Oftentimes it is the experienced swimmer who gets into trouble if he becomes less cautious in his water behavior or is addicted to performing stunts.

The greatest difficulty seems to be from acute head colds, and increasing care should be taken with this type of case in the future. Even under the best conditions, including proper mode of swimming, breathing, etc., this is bound to be a menace. If we can keep the person with a head cold from swimming we will probably eliminate most of the otitis in these camps.

SUMMARY.

Camp	No.	Sex	Water (bacteria)	Swimming (type)	Showing Pathology: Not limited	Limited	Absolute Hazards	Complications
A	98	F.	76	Amer.	18	12	0	1 laryngitis
B	99	M.	22	Amer.	35	14	3	1 O. M. A.
C (1)	115	M.	109	All	24	13	0	0
C (2)	72	M.	109	All	13	7	2	2 O. M. A.
D	106	F.	1650	All	22	12	1	1 salpingitis
E	74	F.	290	All	12	4	1	2 O. Ext. 1 tonsillitis
F	88	M.	180	Amer.	18	14	4	0
G	88	M.	161	All	20	14	1	0
H	48	M.	3	All	21	4	0	2 salpingitis 2 tonsillitis
I	46	M.	200	Amer.	6	7	0	0
J	82	F.	320	All	18	11	2	0
K (1)	100	M.	116	Amer.	46	4	1	1 O. M. A.
K (2)	46	F.	116	Amer.	13	3	1	1 salpingitis
L	52	F.	76	Amer.	7	4	0	0
M	64	F.	13	All	16	8	0	1 salpingitis 2 tonsillitis
N	57	M.	320	All	8	8	0	1 O. Ext. 1 Fr. Sin.

Explanation: Under "Swimming, Type," Amer. refers to American crawl when used to exclusion of Australian.

CONCLUSIONS.

1. The incidence of otologic complications following swimming may be greatly reduced by proper routine precautions. These include careful regulation of the amount of swimming,

avoidance of fatigue, chilling, etc., and especially proper swimming and breathing in the water. In our experience the type of swimming or the bacterial content of the water do not seem to be important factors.

2. Elimination or restriction of cases which, due to existing pathologic conditions or respiratory infections, might be classed as hazardous, is of value in the prevention of complications. Careful medical supervision is essential.

3. The acute head cold seems to be the greatest menace and presents the greatest problem.

This is simply confirmatory of the findings of Taylor and Fenton, and shows what may be accomplished, in the way of minimizing these complications by proper supervision and precautionary measures.

The bacteriologic examination of the water was done by Dr. E. W. Campbell, Director of the Division of Sanitary Engineering, Maine State Department of Health.

The following camps were included in this study: Abena, Arden, Arcadia, Cobbossee, Jo-Lee, Kennebec, Merryweather, Modin, Pine Island, Ridgeway, Runoia, Somerset, Winslow and Wyconda. The writer wishes to express his thanks to the directors and physicians of these camps for their cooperation and courtesy.

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PROFESSIONAL BUILDING.

XXXIX.

SOME UNUSUAL CASES OF LATERAL SINUS THROMBOSIS.*

By Arthur M. Alden, A. M., M. D.,†

St. Louis.

Thrombosis or thrombophlebitis of the lateral sinus is one of the most serious and at the same time one of the most interesting conditions that the otologist is called upon to diagnose and treat. Occurring as it does as a sequel to infection of the middle ear and mastoid and often associated with sepsis, the diagnostic picture is frequently a confused one. Where this condition develops slowly, secondary to a coalescent type of mastoiditis, with slow erosion of the bony plate covering the sinus, the formation of a perisinus abscess and later the invasion of the sinus itself by bacteria, with the typical chills alternating with hyperpyrexia, the diagnosis is not difficult. Unfortunately, however, these made to order cases constitute by far the great minority, and we are more often called upon to differentially diagnose this condition in the presence of several other possible sources for our symptoms. The cases which I shall report are not presented with a view to contributing anything to our already fairly adequate comprehension of the mechanism of this interesting condition, but because each case represents some special diagnostic or therapeutic problem of its own.

Case 1.—G. K., a shopgirl, 16 years old, entered the hospital January 10th, at night, on account of fever and earache of two days' duration. When examined the next morning, her temperature was 102.6° and her W. B. C. 11,500. The right ear canal was so much swollen that the anterior and posterior walls were almost in apposition, but with a small speculum

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†Read before the meeting of the middle section of the American Laryngological, Rhinological and Otological Society, Chicago, January 9, 1929.

the drum could be seen and was found to be somewhat reddened but retracted. A diagnosis of otitis externa diffusa was made and the patient treated accordingly. The fever came down promptly, her pain subsided and she was discharged January 16th, apparently well.

She reentered the hospital January 24th, complaining of pain in all her joints and back. The mother stated that the child had been well for three days after coming home from the hospital, but then developed fever, general malaise and had been very sick for the last four days. The change in her appearance was striking. On her previous admission, she was a plump, rosy faced girl, apparently not very sick. On her second admission, her appearance was that of a profound toxemia. Her skin was gray in color, her face was drawn and her mouth dry. Her temperature at this time was 104° and her mentality clouded. She complained bitterly of pain in her back, knees and shoulders. The pupils were equal and reacted to light and accommodation. There was slight stiffness in the neck and the Kernig was plus. The W. B. C. was 9,000, and the spinal fluid, which was under slight pressure, gave a count of 120 cells, though no organisms could be seen.

Examination of the ears at this time revealed a normal left ear, while the drum on the right side was dull gray and much retracted. There was some reddening around the periphery and along the handle of the malleus. The spinal manometer test made at the time of the lumbar puncture showed apparently complete obliteration of the lateral sinus on the right side, as the fluid rose to the top of the tube when the left internal jugular vein was compressed. Based upon her previous ear history and the present clinical findings, a diagnosis of thrombophlebitis of the right lateral sinus and beginning meningitis was made.

The mastoid was opened under light gas anesthesia, and all cell walls were found to be intact, though the mucosa of the large pneumatic cells was reddened, edematous and showed small areas of localized hemorrhage. The bone covering the lateral sinus was intact, but when removed exposed a dura that was reddened, though the sinus was dull white in appearance and firm to the touch. The internal jugular vein was

ligated in two places above the facial vein but was not cut. The sinus was then opened and a firm white clot, which had begun to disintegrate in the region just above the jugular bulb was removed. It was necessary to carry the exposure backward to the superior longitudinal sinus before free bleeding could be obtained. A very wide exposure of the dura over both the cerebellum and the lower portion of the temporal lobe was made on account of the evidence of beginning meningitis. The exposed dura was covered with rubber and the wound dressed open. The patient went off the table in poor condition. Four hours following operation her temperature rose to 107° and two hours later she expired without regaining consciousness. Autopsy was refused by the family.

This case is typical of the hemorrhagic type of mastoiditis so well described by Kopetzky. Here the local spread of the infection, from the middle ear to the mastoid and the contiguous intracranial structures, often takes place simultaneously by way of the local blood channels. This girl had from the first a severe fulminating type of mastoiditis, but lack of profuse secretion and pressure within the middle ear, coupled with an involvement in the external canal, caused the diagnosis to be missed, and, when the temporary remission of her symptoms took place, she was dicharged from the hospital. Although the symptoms referable to the middle ear all subsided, the process inside the skull continued, and it was only with the onset of symptoms which pointed to intracranial disease that the presence of a serious infection was recognized.

Case 2.—R. H., nine years old, admitted to the Children's Hospital February 3, 1925. The parents state that just before Christmas, 1924, the boy had a severe cold, and after a week of coughing developed what the family physician said was pneumonia. This kept him in bed for two weeks. Two days before Christmas he complained of earache on the right side, and the day after Christmas the mother noticed that this ear was somewhat swollen and protruded from the head. At this time he had fever and for four days had constant pain in this ear. At the end of four days the ear began to discharge and the pain subsided, but the child complained then of stiffness in his legs and would not move them without crying out. Throughout January, he continued a septic course, with fever

from 99 to 104, which alternated with chills and sweats. During this entire time he had constant pain in the joints of his legs. In the last two weeks of January the fever was much less, until two days ago, when it again came up to 105. The joint soreness is now much worse, and at the present time also affects the arms.

Examination.—A very much emaciated boy of nine years, acutely ill, lying on his back with limbs drawn up. The child cries out when any of the extremities are moved. The skin is very pale as are also the mucous membranes. The spleen is easily felt and the liver can be palpated four cm. below the costal margin. The musculature of the extremities is extremely wasted. The right arm can be moved slightly without pain, but the child fusses when any of the other extremities are moved. The left ear is normal save for slight retraction and loss of luster of the drum. The right ear canal is filled with thick yellow pus which, when cleaned away, reveals a perforation just behind and above the short process of the malleus. There is a distinct sag of the superior wall of the auditory canal. The tonsils are small, submerged and definitely infected. The nasopharynx is almost entirely filled with an infected adenoid mass, and there is pus on the floor of each side of the nose. The anterior cervical lymph glands on the right side are much swollen and sensitive to touch, although no fluctuation can be determined. R. B. C., 3,424,000; W. B. C., 9,100. Blood culture negative. The examination of the eye grounds revealed no abnormality .

Operation.—February 5, 1925, under gas-ether anesthesia the usual simple mastoid operation was done. The cells were of the diploetic type. There was some bony destruction around the antrum, which was filled with pus and granulations. The bone over the lateral sinus was firm and showed no evidence of necrosis. The lateral sinus was exposed about one cm. from the mastoid tip, and upon the removal of the bone covering the sinus free pus flowed into the wound. The dura covering the sinus in this region was necrotic, and the pus came from the sinus itself. The wound was lightly packed, and after change in toilet the internal jugular vein was exposed in the inferior triangle just external to the sternomastoid muscle. This was done on account of the extreme cervical adenitis in the superior

triangle. The vein was ligated in two places but not resected and the neck incision closed with clips. Returning to the mastoid wound, the bone over the lateral sinus for the distance from the mastoid tip to within one cm. of the superior longitudinal sinus was removed. The sinus itself was filled with a partly broken down thrombus, and from the region of the jugular bulb free pus was obtained. Free bleeding was not obtained from the posterior end, although a probe was passed backward in the sinus as far as the sinus confluens. A gauze drain was placed in the sinus throughout its extent and the mastoid wound partly closed with gut and skin clips.

February 6, 1925. The child's general condition is good. There is distinctly less soreness in the joints and the patient appears less toxic. Five hundred cc. of citrated blood given with very little reaction.

February 7, 1925. Culture from the ear pus showed staphylococcus aureus. Cultures from the mastoid and lateral sinus taken at time of operation showed hemolytic streptococcus. Blood culture negative.

February 9, 1925. The child can now straighten out one leg and the other joints are much less sensitive to motion than before.

February 24, 1925. Child sitting up in bed and can move all joints without pain.

February 26, 1925. Tonsillectomy and adenoidectomy under gas; uneventful.

March 3, 1925. Child discharged from hospital in good condition.

This is another case of the hemorrhagic type of mastoiditis with profound blood stream infection, even though two blood cultures were negative. Just why no secondary suppurative foci developed and why the large joints bore the brunt of the septic attack are both questions that would furnish material for considerable discussion.

Case 3.—J. J. L. This case is reported through the permission and courtesy of Dr. Eugene L. Myers, with whom it was seen in consultation. Patient was a schoolboy, six years old, first seen in March, 1926, on account of a double otitis media following scarlet fever. At that time both ears were discharging profusely, but the little patient had no temperature, looked

well and said he felt well. Under conservative treatment the right ear ceased discharging and the output from the left ear was much diminished. However, early in May the right ear, which had been quiescent, again began to discharge and, due to the fact that the perforation in the drum was inadequate, it was reincised under gas. At this time there was slight mastoid tenderness to deep pressure over the tip and a suggestion of a beginning sag of the superior canal wall on each side. X-rays, however, showed no evidence of cell destruction and only the amount of cloudiness that one could expect from a profuse otitis media of several weeks' duration. Four weeks later the condition was much the same except that the child did not look so well, and on June 4th a very marked sag was seen in each superior canal wall. The child was sent into the hospital, and on examination there the temperature was normal; W. B. C. 9,500 and hemoglobin 50 per cent by the Sahli. X-rays taken at this time showed definite evidence of beginning cell destruction on each side.

Based on the duration of the infection, the profuse discharge, the sag in the superior canal walls, the general condition of the patient and the X-rays, a diagnosis of double mastoiditis with probable involvement of one of the lateral sinuses was made, even though the patient had no fever and there were no external signs of such a condition.

Under gas anesthesia a double mastoid operation was done. On the left side the cortex was thin and the lateral sinus encountered far forward and close to the surface. All cells were filled with pus, and there was necrosis in the angle between the anterior border of the sinus and the floor of the middle fossa. The sinus was exposed for a distance of three-fourths of an inch at the knee, and its wall found to be dead white and very firm to the touch. No further exploration of the sinus was thought advisable until after the right mastoid had been opened. On this side the condition of the bone and position of the sinus was much the same. Here the vein was firm to the touch and the wall discolored. Incision into the sinus revealed a firm white clot, apparently uninfected. At this time the question of ligation of one or both jugular veins naturally arose, but inasmuch as the patient had been without fever or other evidences of a blood stream infection it was thought best to

delay this procedure until other symptoms suggested its advisability. The child was typed for transfusion, and on the following day 350 cc. of citrated blood was given. This was followed by a marked temperature reaction which subsided rapidly. At no time during the convalescence was there any swelling or edema of either side of the head or other evidence of block to the return circulation from the brain. On June 11th, six days after operation, a spinal puncture was done and the manometer test made. On pressure over either of the jugular veins low down in the neck a very slight rise of the fluid level in the manometer tube was noticed. This was equal on both sides, but it was only a fraction of the fluid rise that one could expect from a normally functioning jugular. Two more transfusions were given during the next ten days and, with no further surgical interference, the child made an uninterrupted recovery.

That this is a case of aseptic thrombosis of both lateral sinuses there is no doubt. Apparently the condition arose very slowly, allowing time for a compensatory collateral circulation to be established. This was probably by way of the inferior petrosals. The judgment of the operator in his policy of non-interference with the jugular veins might possibly be questioned, but certainly if the collateral circulation was established by way of the inferior petrosals, ligation of the jugular veins, even high up, would have shut off this avenue of drainage and probably caused the death of the child. The happy outcome justifies the procedure followed out in this case.

Case 4.—D. S. Patient was a young business man on whom the radical operation for chronic mastoiditis with cholesteatome was performed July 17th. At operation the cells were small and the entire tip was sclerotic. The mastoid antrum was filled with pus and cholesteatome, as was the attic. This was thoroughly cleaned out and the remains of the malleus and incus extracted. No dura was exposed at the operation, and the posterior wound was almost entirely closed because a flap plastic on the membranous external auditory canal made drainage apparently adequate through the ear. After operation the patient vomited all day and complained of extreme nausea. This, however, was attributed to the morphin which he had received before operation. His temperature was 102° and the W. B. C. 8,000.

July 19th. Vomiting has ceased but the fever is 102° all day. W. B. C. 6,000.

July 20th. First dressing; upper clips removed and patient says he feels good but complains of some nonlocalized abdominal tenderness. W. B. C. 5,200, fever 101°.

July 21st. Temperature 102.6° and patient becomes very dizzy on sitting up in bed. No nystagmus present. Pulse 70.

July 22nd, 11 a. m. Temperature 101°, pulse 68, W. B. C. 6,000. In view of the continued fever with the absence of a leucocytosis, an examination of the patient's blood for malaria was done and reported negative. On account of the slow pulse a neurologist was asked to see the patient, and after a thorough examination found him practically negative as to reflexes; there was no neck rigidity and the fundi were normal.

July 22nd, 8 p. m. Patient had a distinct chill which lasted ten minutes and his fever came up to 104° with a quick drop to normal.

July 23rd, 9 a. m. Patient's temperature is normal and he appears to be in excellent spirits. The remaining clips were removed and, except for a slight amount of secretion, the wound looks good. W. B. C. 6,000, pulse is still 68.

July 23rd, 7 p. m. Patient's temperature came up to 104° again following a slight chill. Blood taken for culture and typing for transfusion. The note made on the patient's chart at that time was as follows:

"In view of the pulse and the occasional vertigo, without nystagmus and without other signs of increased intracranial pressure, it seems reasonable to think that this patient has had a perisinus or extradural abscess since the time of operation. It is possible that the lateral sinus became involved at the time of the first chill and that he now has a thrombus in the sinus, either mural or complete. If he has a blood stream infection, just why he runs a leucopenia is hard to explain."

July 24th, 11 a. m. Patient had a chill with definite projectile vomiting. Temperature rose to 103.6°, W. B. C. 6,400.

July 25th. Patient's temperature at 8 a. m. was 96°, and he has a slight mixed horizontal and rotary nystagmus to the left. Pulse 70.

A spinal puncture was done and the fluid found to be apparently not under increased pressure. When the manometer was

put on and pressure made upon the jugular of the affected side a rise of only five points was noted in the fluid, while compression of the jugular over the unaffected side caused a rise of 12 points. This observation was confirmed by trying it several times. The spinal fluid taken at the time of the test was reported entirely negative by the laboratory.

Based upon the above findings, a tentative diagnosis of thrombosis of the left lateral sinus, with or without extradural abscess, was made and the mastoid reopened. The cavity was found partly filled with a blood clot and the bony wall covering the lateral sinus appeared to be intact. It was removed, however, and the sinus exposed for a distance of an inch and a half at the knee. The dura covering the sinus was discolored at the knee and the sinus itself felt firm to the touch. Both ends were blocked and the sinus opened. A firm clot attached to the external wall of the sinus and occupying about three-fourths of the lumen of the vessel was exposed. There was no evidence of disintegration of the clot, and inasmuch as free bleeding was obtained from the sinus above and below the clot, the jugular vein was not ligated but the plugs allowed to remain in place. No evidence of extradural or intradural abscess was found. Patient went off the table in very good condition except for a somewhat rapid and feeble pulse. On return to his room he was given 250 cc. of glucose intravenously and a few hours later appeared to be in very good condition.

July 27th, 7:45 a. m. Patient had a chill which lasted for ten minutes, after which his temperature rose to 102°.

July 28th, 8 a. m. Patient had another chill, followed by fever to 101.6°. This came down promptly. Dressing was changed.

July 29th. Another chill at 7:45 a. m., followed by fever up to 103°. The W. B. C. since operation had never been above 7,500. At this time we were at a loss to account for the patient's fever and chills. Although a blood examination for malaria had been done a week before and pronounced negative, several more slides were made, and upon examination about 3 per cent infection with tertian malarial parasites was found. Patient was immediately started on quinin therapy.

July 30th. Very slight chill; gauze removed from sinus and wound is clean.

August 6th. Secondary closure of mastoid wound done under gas. From this time on the patient had no more temperature and his convalescence was uneventful.

This case presents several unusual features. The combination of an aseptic thrombus in the sinus with malarial infection is one that I have not encountered before in the literature. Just why this patient ran the very slow pulse, 60 to 70, throughout the course of his fever, is hard to explain. Also what produced the definite nystagmus that was observed on the day of his second operation? In all probability had the malarial infection been determined earlier and adequately treated the presence of the thrombus in the lateral sinus would never have been suspected. This leads us again to wonder how many of our mastoid cases develop postoperatively a partial or complete aseptic thrombosis in the lateral sinus contiguous to the operation.

XL.

THE MASTOIDS, FOCI OF INFECTION FOR ARTHRITIS: REPORT OF A CASE.*

By Taylor S. Burgess, M. D.,

Atlanta, Ga.

The potentiality of middle ear infection as the basis of far-reaching systemic disorders has never received proper attention. This is evidenced by the paucity of the literature upon the subject in spite of the frequency with which cases, especially children, are seen in extreme degrees of malnutrition, anemia, general poor health and often definite disease entities accompanied by discharging ears. The response of the general bodily metabolism to cleaning up the ear infection is remarkable. The case cited below is a clearcut example of the major rôle that may be played by chronic ear pathology in the above mentioned conditions.

REPORT OF CASE.

B. P., a nine-year-old white girl, entered the hospital August 7, 1925, complaining of discharging ears, rheumatism and repeated boils.

The present illness began five months prior to admission. At this time, during an attack of scarlet fever, both ear drums ruptured spontaneously. Since then the ears have discharged continuously. About ten days after this the right knee became tender, swollen and very painful on motion. Subsequently there was involvement of the other knee and both hips. Although the acuteness of the pain subsided, pain at times had persisted in all of the involved joints, and they were tender and very painful on any attempted motion.

The patient had had many abscesses over various parts of her body. They appeared singly or in twos and threes; never any great number at the same time. The last one had healed

*This case is reported through the courtesy of the State University of Iowa Hospital where it was observed by the writer when an interne on the service of Dr. L. W. Dean.

two weeks prior to admission. They had apparently not been accompanied by any severe clinical symptoms except local reaction.

Ten days prior to admission she developed a soft, tender swelling behind the left ear, and the temperature rose to 103°. This had been repeated twice. On each occasion there was an increase in discharge from the ear and the temperature dropped to normal.

The patient had been confined to bed during the entire five months. She lost weight steadily, and at the time of admission was little more than skin and bones.

Physical Examination.—Ears: Both canals filled with thick, yellow discharge with very foul odor. Both drums were destroyed except for small anterior crescents. Bone over left mastoid rough. No tenderness anywhere.

Functional tests: Right ear, forced whisper and spoken voice heard at one foot. Left ear, whisper was not heard, spoken voice at a few inches. The two middle tuning forks could just be heard in the right ear when forcibly struck, could not be heard by the left ear. Caloric reaction was normal in type in both ears, occurring in the right ear in forty seconds, and in the left ear in two minutes.

X-ray showed well developed mastoids with blurring of all cells and considerable bone destruction.

Throat: Tonsils and adenoids had been cleanly removed. This had been done during the present illness without any effect upon her condition. Cervical glands were palpable.

Nose: There was a little mucoid discharge in the nares but no pus. X-ray showed possible blurring of both antra.

General examination: A bed-ridden, markedly emaciated, white girl of nine years looked sick and seemed to feel miserable. Both knees and hips were tender on manipulation, somewhat swollen, and almost completely ankylosed. Many scars of incised abscesses were seen. Lungs were clear. Heart had a slight systolic murmur at the apex. The temperature was of the low grade, septic type, with an evening rise of 100 to 101 degrees.

Laboratory work: W. B. C. 9,000, R. B. C. 4,000,000, Hbg. 65 per cent. Urine negative except for a faint trace of albumen. Blood culture was negative. Blood Wassermann was negative.

Culture from the mastoids at the time of operation showed a short chained streptococcus.

Treatment: On August 11, 1925, a radical mastoid operation, left, was performed under ethelene anesthesia. A large cell type of mastoid was found filled with pus and granulations. There was a large sequestrum of bone in the region of the aditus. There appeared to be a fistula in the bony horizontal semicircular canal. Pressure over this produced no movement of the eyes. There had been a perisinus abscess and the wall of the sinus was found exposed. It was roughened and gave the impression of a healed phlebitis; but the sinus underneath was compressible, and was not disturbed.

On September 2nd, a radical mastoid operation, right, was performed, and an extensively diseased mastoid exenterated. Neither sinus nor dura was exposed.

The patient began to improve almost immediately after the last operation. The temperature curve became normal, she complained less of her joints, had no more abscesses and seemed to be gaining weight. On October 5th, the condition of her ears was satisfactory; and she was transferred to the orthopedic department where various manipulative and operative procedures were carried out upon the involved joints, after which she was sent home.

The patient was seen on three occasions after this when she had returned to the orthopedic department for further work. Each time there was a noted improvement in her general condition, and the state of her ears was satisfactory. On the last visit, November 15, 1926, she was able to get about indoors with the aid of a stick, and out of doors with crutches. She had gained much weight and seemed well and happy. There was a little mucoid discharge from the eustachian tube of the left ear. The right ear was perfectly dry. Her hearing had improved slightly in the left ear; but markedly in the right ear, where she was able to hear a whisper at three feet and the spoken voice at six feet.

Last December, two years and four months since she was first seen, a letter was written to determine her condition. She reported still further improvement. She weighed seventy-seven pounds, and her joints had improved so that she could get about indoors without any aid, and out of doors with a cane

only. Her hearing seemed to have improved, as she was able to hear the clock ticking in the next room; and she was up to the school grade called for at her age.

Dr. Dunbar Roy,[1] in 1923, reported a case of acute arthritis complicating otitis media in a four-year-old boy. The arthritis refused to subside till both mastoids had been operated upon. In his study of the literature Dr. Roy reports fifteen cases. To these cases I have been able to add only two others, both reported by Dr. Fred Kierhle[2] of Portland, Oregon. They were two children with otitis media complicated by suppurative arthritis of hip and knee joints requiring surgical drainage of the joints.

None of these cases are exactly similar to the case just reported; nor could I find in the available literature a case in which both lesions had reached the chronic stage where the effect of ear surgery on the joint lesion was recorded.

In the case under consideration, several features are worthy of emphasis.

The mastoid invasion was insidious. Except for the flare-up noted ten days prior to admission there was nothing in the history to signify extension of the infection into the mastoids; and yet the involvement was very extensive and clearly of long duration.

The clinical picture was one of far advanced, progressive sepsis depending upon some focus of infection. Tonsillectomy had not brought about any improvement. Immediately after mastoidectomy general improvement began and progressed steadily.

The degree of function restored to the joints by orthopedic treatment was very striking. This suggests very strongly that had the mastoids been attacked earlier in the course of the disease recovery would have been more complete.

The question of how the systemic invasion occurred is a mooted one and I do not believe can be definitely answered. The patient evidently had a septicemia, and probably a true bacteremia. Whether this occurred by way of the lateral sinus or through direct lymphatic absorption is a problem. If the sinus was involved it was a mild affair, as there was nothing in the history to suggest the usual picture accompanying lateral sinus invasion. However, operation disclosed a definite peri-

sinusitis and suggested phlebitis. A bacteremia in the absence of sinus involvement is rare. Dr. Kopetzky,[3] of New York, discussing this problem, suggests that in the thrombophlebitic type of mastoiditis the systemic invasion is direct, while in the coalescing, bone destroying type it is by way of the lateral sinus.

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XLI.

AGRANULOCYTIC ANGINA: REPORT OF TWO CASES, ONE DEATH AND ONE RECOVERY.*

By R. E. Windham, M. D.,

Longview, Wash.

The apparently increasing appearance of sporadic cases of agranulocytic angina seems of sufficient importance that all angles and new phases of this most baffling condition should be brought up for discussion, especially as its prognosis is so unfavorable.

This condition was first brought to our attention in 1922 by Schultz of Germany, he giving it its name and believed it to be a clinical entity, while others have called it merely a syndrome.

Dr. Beatrice Lovett of Chicago seems to have recorded the first case in America, and she said, although no definite etiology has been found and the pathogenesis is as yet unexplained, the great similarity of symptoms of all cases, the blood picture and the course indicate that agranulocytic angina is a true clinical entity.

A striking feature of this disease is its prevalence in women of middle age, there being only three men and one child reported in Germany, and one child by Dayton of Tacoma, Washington, out of some forty-five cases reported.

Another striking feature is its high mortality. Of the statistics collected by Kastlin there were three recoveries in forty-three cases, these being in Germany, there being no other recovery reported in America to date.

The onset in all cases is similar and sudden, with sore throat and fever. The throat shows ulcers and an exudate, particularly on tonsils, resembling diphtheritic exudate, and in most cases on a dark necrotic base. Next in frequency have been

*Read before the Oregon Academy of Ophthalmology and Otolaryngology, Portland, Oregon, February 19, 1929.

the gums, hard palate and genitalia showing lesions of similar appearance. Moore and Wieder of Philadelphia state that skin and intestinal lesions have been found and that the most characteristic anatomic change is found in the bone marrow, which appears to be the seat of the disease. They state that where there is opportunity to examine the bone marrow, the absence from this of neutrophils, myelocytes and myeloblasts and the presence of megakaryocytes, erythrocytes and erythroblasts are conclusive evidence of agranulocytic angina.

The lesions all begin as whitish to gray areas, turning to a dirty gray, then to a blackish gray on a black necrotic, gangrenous base, with a very offensive odor, stinking a whole ward. The odor, I believe, is almost diagnostic and pathognomonic when once detected.

Some report cases as being icteric, while Zadek and others report cases showing a thrombopenia and marked tendency to hemorrhage.

It is self-limited to mucous membranes, destroying it down to the muscle but not going beneath. The gum tissue being completely destroyed down to the bone, and when the tonsil is involved, a complete tonsillectomy by slough occurs down to the underlying muscles. A fair number of cases seem to occur following extraction of teeth, such being the case in one of the author's cases.

Bacteriologically, the question is still unsettled, but from the nature of the condition and the apparent prevalence of bacillus pyocyaneus in so many cases there seems no question but what it might be the causative organism, together with some anaerobic organism obligatory or facultative. Other organisms have been recovered, as streptococci, staphylococci, diphtheria bacilli and Vincent's spirillæ, and have been considered a mere coincidence or associated and not causative.

The clinical picture, other than the lesions and throat condition, is of no consequence, no other evidence of disease being found, even to a very mild or no cervical gland, involvement with such a severe anginal affair evident in no other type of infection.

Pathologically, there seems but little information found at autopsy. The liver, spleen and kidneys were unchanged, except

for slight enlargement and parenchymatous degeneration and some passive congestion of the liver, the red bone marrow appearing normal. The intestines showed some petechial areas extending through the mucosa down to the muscular coat.

Icterus was evident in my fatal case, but there was no evidence in the recovery.

The blood picture seems very characteristic if not pathognomonic, there being a moderate to a severe leukopenia, the total whites going down to a few hundred and the polymorphonuclear leukocytes very low, to almost zero in given cases, while the mononuclears are greatly increased up to 90 per cent and more, while the platelets remain about normal, as does the hemoglobin percentage, there being no anemia.

Histologically, there is not much information to be gained. The liver showed no marked changes. In some areas there was diffuse perivascular lymphocytic infiltration. In the spleen there was a marked development of sinus endothelium at the expense of the lymphatic tissue.

The kidneys showed numerous bacterial emboli through the cortex, with some in the medullary substance, and the absence of inflammatory changes was very striking.

The stomach and intestines showed necrotic areas down to the muscular coat.

These findings were similar to those of Pietti on Shiles' case.

Pietti of Oak Park, Ill., states that the bacilli enter the human organism by some unknown route, rapidy destroying all the polymorphonuclear leukocytes; then they multiply and give rise to numerous embolisms throughout the body, meeting with no opposition or resistance. The lymphocytes, which are immune to the destructive virus, are entirely unable to defend the body.

COMMENT.

1. Because agranulocytic angina attacks the throat it may at first be confused with diphtheria or Vincent's angina.

2. There is never any appearance of the condition in the nose or nasopharynx, which is evidence that it does not thrive where there is free circulation of oxygen, but goes where oxygen is somewhat excluded.

3. The organism seems to be anaerobic, and the treatment should be instituted with this in mind and try to meet the offender on equal footing.

4. It is not common in children, possibly due to the tissues being richly supplied with oxygen due to their rapid circulation, and is more prevalent in middle aged women when their circulation is naturally slowed down and tissues get less oxygen.

5. That the disease is a local one and seldom produces septicemia, as all anaerobic organisms avoid the blood stream because of its oxygen carrying power. Therefore its tissues of choice are the hidden areas where the free circulation of air is restricted.

TREATMENT.

1. As a matter of safety, an initial dose of diphtheria antitoxin is given.

2. Neoarsphenamin and metaphen are given intravenously on alternate days for three or four doses each.

3. Sodium salicylate, grains 7½, given orally every three hours, but as to what good it might do is questionable.

4. The areas are cleansed of all necrotic tissue possible; then chromium trioxid applied well and into crevices; then hydrogen peroxid given into the mouth, which, when the two combine, liberates a strong content of nascent oxygen. The chromium trioxid unites with the saliva to form chromic acid (orange color). The hydrogen peroxid then oxidizes the chromic acid to perchromic acid (blue). Then the two mutually decompose, liberating nascent oxygen, producing a brown color. This last item is also specific for Vincent's angina and trench mouth in one to three treatments, at twenty-four hour intervals.

5. Tr. benzoin compound is applied to the lesions daily, following the above, to stimulate granulation and healing.

6. Hexylresorcinol (S. T. 37) used as a mouth wash, full strength, every hour until all danger seems past, then several times a day for a period of time as a precaution.

CASE HISTORIES.

Case 1.—Mr. B., age 62, a laborer. First seen on June 28, 1928, and admitted to Longview Memorial Hospital, complaining of general malaise and a very sore mouth and throat. He gave a history of having a number of teeth pulled twenty-five days previously.

Examination showed the teeth all out and a dark gray to black discharging gangrenous condition along the upper gum lines extending to the middle of the hard palate, tongue badly coated and a very foul odor. Right side of face slightly swollen and tender. The blood pressure was 148 over 68. Temperature 103.4°, pulse 120 and respirations 20 on admission. The physical examination otherwise was negative and past history of no consequence.

This patient was icteric and somewhat anemic, the red blood cells being 2,400,000 on admission and went down to 1,592,000 on July 6, three days before death.

On admission the total whites were 2,000, hemoglobin 45 per cent, polys 5, mononuclears 94 per cent, eosinophils 1. On July 6th, the last blood count, the whites were 240, the H. B. 30 per cent, polys 4, and lymphocytes 95.

The blood culture was sterile. From smears staphylococci and streptococci were found. On culture bacillus pyocyaneus were found. Urinalysis was negative throughout.

The patient developed a mild hypostatic pneumonia the last two days of life, and the temperature was 106° on date of death.

Smears from his mouth rubbed into a rabbit's mouth showed no signs of infection, the rabbit being killed for safety.

The infection covered his entire mouth before death and at all times was gangrenous and very foul.

Autopsy showed but little and gave but little information, as previously mentioned.

The treatment in this case was more of a general nature, as little was known at that time as to what was best. The mouth was treated locally daily, but he did not get the detailed treatment as outlined and as was given in case No. 2.

Case 1.—Mr. P., age 35, was admitted to the Longview Memorial Hospital on November 18, 1928, complaining for the last five or six days with general malaise, sore throat and aching.

A general physical examination was negative. Examination of the throat showed the throat somewhat red and swollen about the left tonsil, and the left tonsil covered with a dirty gray exudate on a black base. There were about six small areas on soft palate and pharynx. On admission the temperature was 103°, pulse 84, respiration 20, total whites 7,900, polys 24, lymphocytes 75. During the illness the lowest white count was 1090 and polys 20. Urinalysis showed many urates and few hyaline and granular casts only.

On August 14, 1928, this case had a 3 plus Wassermann and received ten doses of neosalvarsan of .9 gm. each, between August 14th and October 15th, and seven doses of bismuth of .1 gm. each between October 14th and November 14th, before admission to the hospital on November 18th.

On November 20th, a puncture was made into the left peritonsillar area to relieve the pressure. On the 21st, the left tonsil was lifted out as one necrotic piece. On the 22nd, the throat proper looked better, but on each side of the hard palate opposite the first molars, there was a white area one inch square which involved about two-thirds of the hard palate. On the 23rd, these areas were black and gangrenous and were lifted out, leaving the muscular coating here. There was now an area outside upper jaw opposite second molar one-half by one inch and inside and outside on left lower jaw one-half by one inch on area centering at last molar which were lifted out, leaving the bone bare. On this date I gave the family a bad prognosis, not believing he would recover. On the 25th, there were no new areas involved, and from then on there was gradual improvement, and the patient was discharged from the hospital on December 5th, with the loss of much tissue and several areas of jaw bone exposed one-fourth by one inch, which areas continued to gradually heal over. This case received an initial dose of diphtheria antitoxin and on alternate days received neosalvarsan and metaphan intravenously. If the lues and antiluetic treatment played any part in causing the disease, why

did he get well receiving the same medicine? Other treatment was as outlined under treatment. Treating the first case, I was at sea, but before having the second case I had done some thinking and felt better armed to tackle the second case, and here's hoping I never have another.

Following the discharge of this patient from the hospital pieces of alveolar processes from both the upper and lower jaws, one-fourth by one inch, came away as sequestra from the areas where the soft tissues had previously sloughed away. The teeth here became very loose, necessitating their extraction.

Blood culture was sterile; smears showed staphylococci, streptococci and Vincent's spirillæ. Culture from mouth showed many streptococci and bacillus pyocyaneus; no Klebs-Loeffler. A piece of necrotic tissue from patient's mouth was buried in a rabbit's mouth and in five days showed a similar necrotic area, and a culture from it showed bacillus pyocyaneus. The rabbit was killed and burned.

My laboratory facilities were very limited, but I believe some light is thrown on this most perplexing disease.

CONCLUSIONS.

1. The disease is of the throat and other areas where the air is limited or excluded and is gangrenous in nature with a characteristic appearance and odor.

2. The offending organism is undoubtedly bacillus pyocyaneus plus some organism obligatory or facultatively anaerobic in nature.

3. The disease has no definite limitations as to age, sex or social status, but does seem limited partially to those with slowed circulation.

4. Its appearance is becoming more prevalent and its prognosis is very unfavorable.

5. The idea of the type of organism, its selective tissue has been previously stated, but reasons therefor and the method of combating the disease has not been previously stated—that is, its anaerobic nature and the use of oxygen in its treatment.

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XLII.

ETHMOIDITIS PRODUCING HEMIPLEGIA, CONCOMMITANT WITH TOXIC SCARLET FEVER: OPERATION, CURE.

By Morris A. Weinstein, M. D.,

Philadelphia.

Hemiplegia complicating scarlet fever has been reported by Rolleston,[1] who reviewed the literature and collected sixty-six cases, including three of his own. Since his report in 1908 nine more cases have been recorded.

In the series reported the alleged causes of the hemiplegia were: uremia, cerebral embolism, cerebral thrombosis, cerebral hemorrhage, encephalitis, cerebral atrophy, cerebral sclerosis, etc. In not a single case reported is sinusitis mentioned as the causative factor of this complication.

It is interesting to note that in the cases recorded, fifty-four patients recovered, and of this number only seventeen completely. In the surviving majority contractions supervened.

REPORT OF CASE.

W. B., male, aged 10 years, took sick on February 5, 1928, with scarlet fever. On February 9th, the conjunctiva of the right eye became chemosed, upper and lower eyelids began to swell, and the patient complained of severe frontal and parietal headache. Both nasal chambers were filled with a thick purulent discharge. On February 12th, his temperature rose to 105°, pulse to 130, the right eyeball protruded, and the eye was completely closed by an enormous swelling of both lids, extending upwards to the forehead.

Examination at this time revealed thick purulent discharge in both nasal chambers, more marked on the right side. Nasal mucosa was edematous and injected; inferior and middle turbinates swollen and impinging on the septum, and after shrinkage and cleansing, pus was seen in both middle meati and epi-

pharynx. Tonsils had been previously enucleated, and both drums were congested, but landmarks were still clearly visible Conservative treatment was instituted with no evident improvement.

On the 13th of February patient became restless and unmanageable, and two days later paralysis of the entire left side of the body manifested itself. Spinal fluid showed on examination 11 lymphocytes per cm., and proteins were markedly reduced; no organisms were found on smear or culture. Blood examination at this time showed: Hb. 70 per cent, R. B. C. 3,120,000, W. B. C. 9,200, polys 52 per cent.

Under continued conservative treatment the local eye symptoms appeared to clear up for a while but returned in a few days. At this time the right middle turbinate was infracted towards the septum, with the hope of facilitating better drainage and ventilation.

A very prominent neurologist who saw the patient in consultation diagnosed the case as a brain abscess, or cavernous sinus thrombosis with left sided hemiplegia, and advised against any surgical intervention. But the patient grew progressively worse; the edema over the right eye extended way over the forehead towards the left. He became stuporous and nothing but an operation seemed to offer any hope of relief.

On the 26th of February a complete exenteration of the right ethmoid labyrinth by the intranasal route was performed in the patient's home without any anesthesia. Two days later the patient began to regain consciousness and some motion was noted in the left arm, and within two weeks the hemiplegia cleared up entirely. The local orbital symptoms also improved, resulting in complete disappearance of the edema of the eyelids and of the exophthalmos.

During his convalescence he developed a bilateral otitis media and tenderness over both mastoids. A paracentesis of both drums was done and a pus pocket in the soft tissues of the forehead opened and drained. After this his temperature went down and stayed normal. He then made a complete recovery. Throughout the entire course of the disease there was no cardiac or renal involvement.

Hemiplegia complicating acute ethmoiditis is practically unknown; an extensive search of the literature fails to reveal a single case of such character. The transient aspect of this hemiplegia may be explained as due to a collateral edema of the frontal lobe induced by the pathologic condition in the ethmoid labyrinth and the frontal lobe exerting pressure on the motor area of the brain. With the removal of the diseased ethmoid cells and the subsiding of the edema in the frontal lobe, the pressure in the motor area was released and the hemiplegia disappeared. Thus the ethmoidectomy broke the vicious circle.

Bohan[2] reported two cases of hemiplegia, secondary to chronic sinusitis; both cases were of long standing, and the hemiplegia was preceded by persistent frontal headache. In both patients the frontal sinuses were at fault, and the author believes that a localized pachymeningitis externa was the cause of this complication.

It is an established fact that any infectious disease may lead to sinus complications, but scarlet fever tops them all in frequency and severity, similar to the destruction left in the wake of this disease when it affects the ears. Having a tendency to cause necrosis, it finds an ideal place of attack in the ethmoid labyrinth, with its exceedingly thin walls, large mucous membrane surface, small cells, and small openings for drainage. Even a slight hyperemia of the mucous membrane is liable to obstruct the cell ostium, creating a favorable medium for bacterial attack, leading to destructive changes in the mucosa and to bone necrosis.

The danger of sinus involvement is present all during the disease. It may appear in the second, third or fourth week and at the end of the scarlet fever infection.

CONCLUSIONS.

This case presents several features of special interest.

1. Hemiplegia complicating scarlet fever has been noted and recorded.

2. Hemiplegia following sinusitis is a rare complication.

3. A significant fact is that this patient made a complete recovery after the ethmoidectomy, which established sufficient

ventilation and drainage, and released intracranial collateral edema.

4. Sinusitis is a frequent coexisting complication in all acute exanthemata, especially scarlet fever.

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1309 SPRUCE STREET.

XLIII.

OTITIC BRAIN ABSCESS.*

By Frederick A. Kiehle, A. B., M. D.,

Portland, Oregon.

Infinite variety in combination of symptoms in intracranial complications of middle ear conditions adds interest to our study of them and excuses the perennial appearance of this subject on our programs.

To patients, as to our brethren engaged in general work, we cannot too frequently emphasize, (1) the immense importance of every case of otitis media, (2) the strategic position of the middle ear, and (3) the dire consequences, especially in the presence of a purulent infection of the nose or accessory sinuses, of otherwise simple acts, such as coughing, sneezing, nose blowing, etc.

It is not my intention to launch into a description of symptoms, stages of development of brain abscess, or intricacies of differential diagnosis, but I will state again what has been said so frequently, that in surgery lies the only hope for the patient affected with a cerebral abscess. While operation is necessarily always exploratory and often unavailing, yet even in the presence of neck rigidity, flexor spasms, or a somewhat increased spinal cell count, this chance must not be denied him.

Le Maitre says: "The brain is an organ of great tolerance, as proved by the harmlessness of exploratory puncture and confirmed by the history of war wounds of cerebrum and cerebellum. The gravity of brain surgery owes its existence to the meninges or rather to the subarachnoid spaces. Suppressing this danger, the problem is relatively simple, since trepanation itself is attended with little risk and operation on the encephalon also is benign."

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*Read before the Western Section, American Laryngological, Rhinological and Otological Society, Victoria, B. C., January 17, 1929.

†From Department of Otolaryngology, University of Oregon, Medical Department.

A variety of modifications of technic have been suggested comparatively recently. Lemaitre's method is today employed with great success in many large European clinics. His procedure is based upon the well substantiated belief above referred to, that mortality in brain abscess cases is due to infection of the meninges, delivered, not through the dura or through the brain tissues, but through the subdural spaces. These spaces he walls off as follows:

"When the meninges are exposed," he says, "and the pus location has been indicated by means of the needle, instead of cutting the membranes by a sharp instrument, I introduce at the site of the needle a grooved director, allowing the pus to partially evacuate by this means. In abscess of the cerebrum this is important, but it is even more important in cerebellar abscess, because it is known that the pus under tension is not as well borne by the cerebellum as by the cerebrum. Then a small rubber drainage tube is introduced through the small meningeal opening. I have observed that the presence of this tube provokes the formation of fibrous adhesions, which wall off the subarachnoid space. Every day a larger tube is substituted until a diameter of from 9 to 11 mm. is reached. By this time a strong, firm ring of fibrous tissue surrounds the tube, which now functions as a drain. In cerebellar abscess, at this stage I replace the small soft tube by a vulcanized one, which is specially prepared in my laboratory. The particular features of these tubes are that they are fenestrated and the anterior ends are cut obliquely. The obliquity prevents contact between the tube and anterior portion of the sinus, thus avoiding traumatism and grave hemorrhage. In subsequent dressings these tubes are diminished in length but not in caliber, as granulation tissue appears and pushes the tube outward. It is better to await spontaneous expulsion than to withdraw the tube."

This procedure rests upon the fact that the meninges may at any desired point be transformed into a fibrous layer, and this induced seclusion of the subarachnoid spaces should always be secured when the surgeon intends going into the brain. Meningitis is prevented by the same process by which general peritonitis is averted in a case of appendicular abscess, differing only in that the walling off here is induced; in the abdomen it

is spontaneous. The rationale of this method has been definitely proven. Professor Lemaitre has treated in this way a case of cerebellar abscess which died from a second cerebellar abscess developing after the first abscess was progressing to a cure. Autopsy showed a dense resistant ring round the drain; in the tissues beyond, the microscope revealed nothing.

Three things are accomplished by the Lemaitre procedure: 1. Subarachnoid spaces are completely walled off and the danger of infection prevented. 2. Hernia of the brain cannot occur, because the brain is restrained by a reinforced barrier. 3. Gradual increase of the diameter of the drainage tube, while decreasing its length, prevents another great danger, viz., that of leaving within the brain undrained pus pockets. It is important that drainage should not be discontinued too early and it is advisable to continue it from four to five weeks.

The following recent case in my own practice may be of interest, not only because I followed with some modification the Lemaitre technic, but also by reason of the fact that the patient, though extremely sick for a long time, has almost completely recovered:

M. N., schoolgirl, age twelve years. Family and personal history inconsequential, except that at the age of three a left mastoidectomy had been performed, leaving a shallow depression and a wide keloid scar. She had continued to have a running ear on this side for the past nine years.

On April 20, 1928, she was brought to me complaining of increased aural discharge and pain in the left ear. Examination revealed nothing except that the region of the keloid was edematous and slightly red. An X-ray of the mastoid showed that the previous operation had been confined to the superficial cells near the cortex. Most cells remained intact, and in the region of the meatus were definitely cloudy. The next day the attendant reported that the patient was somnolent and was aroused with difficulty from sleep. That same evening the left mastoid was opened and all cells exenterated. The meninges for an area of one square centimeter above the mastoid process were exposed and as the dura seemed of normal color and texture it was not disturbed. Two days later, temperature 104, pulse 140, white blood cells 24,700. A thorough physical examination

by an internist, Dr. John Montague, revealed nothing further than the ear condition to account for the child's symptoms.

The patient three days after the mastoid operation became restless, picking at the bed clothes and moaning in her sleep in apparent pain. Her temperature was 104.2, pulse 140. There was inability to coordinate speech or thought, and spastic contractions of the right hand were noticed, gradually extending up her right arm with clonic convulsions. This was preceded by severe pain in the left frontoparietal region. By the next morning the right hand was flaccid with occasional clonic convulsions. The right foot was now involved, a spastic paralysis extending up her leg. The convulsions now involved hand and foot. There was no choked disc. That evening the patient experienced nausea and difficulty in swallowing.

At 10 p. m., April 25, on the diagnosis of probable cerebral abscess, a decompression one and one-fourth inches in diameter, under light ethylene anesthesia, was performed in the temporal region above the ear. There was no bulging of the dura, which in gross appearance was still normal. On incision, however, pus exuded under pressure. A probe slipped readily into a sinus running forwards and inwards at least three inches. A fenestrated rubber tube of small diameter was then placed along the track of the director. The dural wound was stitched and the patient returned to bed.

The next day the outlook was bad. The patient was restless, in partial shock, and refused food. Convulsions of the right arm and later of the right leg now occurred at from fifteen minutes to one or two hour intervals lasting from one to two minutes. There was an internal strabismus of the right eye. Convulsions continued for five days following. There was complete aphasia. The patient was irrational and continued to resist any effort to feed her. Only the most painstaking and devoted efforts on the part of her nurses brought about the final happy result.

The wound discharged freely, so much fluid appearing at times that it was evident that a ventricle had been entered. In another five days, however, the convulsions ceased almost as suddenly as they had begun. The patient's entire appearance changed, consciousness returned and prospects brightened. The

original small drainage tube was being replaced daily with a shorter one of greater diameter till by the end of the third week all tubing was withdrawn.

The dural wound reopened and there was a large cerebral hernia due to intracranial pressure. A portion of this sloughed and was excised. The rest was forced back by pressure dressings and a plastic operation (fascial implant), performed by Dr. W. H. Bueermann at Doernbecher Memorial Hospital, completely closed the area and gave it protection.

September 15, 1928. The hemiplegia has disappeared and the child uses her right arm and leg freely. The right internal strabismus is still somewhat in evidence. This strabismus is probably accounted for by a small area of meningitis in the base of the brain on the right side near the sixth nerve center. The aphasia is still manifest but the speech is gradually returning with effort. Mentality seems unimpaired.

In conclusion, I will append the communication from Dr. John Montague, internist, to whom I am greatly indebted for his careful study of this case from its onset:

"I think that it is interesting to note the chronology of the symptoms of her brain abscess. First, on April 23rd the pain in her left frontoparietal region and within a few hours the spastic paralysis of her right hand, gradually extending up her right arm, and with clonic convulsions. On the following morning the paralysis of her right hand had become flaccid with occasional clonic convulsions and a spastic paralysis of her right foot, gradually extending up her leg, occurred and the convulsions now involved both hand and foot. That evening she was operated upon, and on the following day she had intermittent convulsions involving the entire right side of the body. That evening the left side of her face became involved, and there was an internal strabismus of her right eye. It is also interesting to note that the convulsions all seemed to start in the right hand and then gradually became generalized and that both general and local convulsions of the right side lasted until May 2nd, when she began voluntary movements of the right hand and foot. The aphasia, I think, developed as you noted.

"On December 19, 1928, I made a complete neurologic examination and found all reflexes normal, and that the strength

of the two hands, arms and legs seemed to be perfectly equal. There is still, as you noted, a tendency to dropping of the right shoulder, and the only residue of her experience that I could make out was a slight aphasia with a tendency to reverse sentences in order and an occasional misnaming of objects."

On this same date (December 19th) I found that the strabismus has entirely cleared up, and, except for the hesitancy in speech, I believe the child would pass anywhere for normal. A Christmas card that I received, written and addressed by her, shows a handwriting certainly as good as the average normal 12-year-old child.

XLIV.

AN OTOLARYNGOLOGIC READING CLUB.

By Jesse H. Roth, M. D., and Samuel J. Pearlman, M. D.,

Chicago.

Medical literature has assumed such unwieldy proportions that were one to devote his time exclusively to the review of medical literature he would find it impossible to read the numerous publications in various languages.

As the vast majority of medical men are engaged in one or another kind of medical practice, their reading is confined to spare moments, evenings, vacations and such. Unless systematized such reading is superficial. The urge to do conscientious and sustained reading may be with most of us, but unless we have some definite purpose ahead or some goal to attain in a specified time, me may neglect to carry out our intentions. Occasionally we find a medical man who tries faithfully over a number of years to carry on a systematized course of current reading and intelligent classification of his reading, but he soon finds that he must plod through a mass of material that is really nonessential and which may simply be an excellent review of what he has already read. He finds that with his clinical work and other demands on his time, his reading becomes a stupendous task.

Several years ago Dr. Joseph C. Beck attempted unsuccessfully to organize an otolaryngologic reading club. The idea was received enthusiastically enough by the younger men invited, but with indifference by those who figured that they had "won their spurs." A year or so later, when the club was reorganized, he was more successful. A very careful survey of the proposed membership was made as to ability to read foreign languages and attitude toward study. No effort was made to give the organization a name but it gradually came to be known as Dr. Beck's Reading Club in spite of Dr. Beck's protest against his name being used in this connection. It seemed to be the happy expression of the club that this name be retained. With one or two exceptions, during the first year

most of the members were present at every meeting. Those members who lacked enthusiasm or failed to attend, were soon dropped and more dependable men added. The membership has not changed in the last two years, and the attendance is practically 100 per cent at each meeting. After three years of the club's existence, the members are of the opinion that it offers them the most important meeting of the month.

The purpose of the club is primarily to abstract and bring up for discussion important publications, particularly in foreign languages. Certain journals are assigned to the members, according to the language that the individual can read and master. In addition, each one is assigned another journal for which he is responsible as an alternate. Thus, if a member finds it impossible to attend a meeting, the alternate presents the abstract and the work of the club goes on without handicap. It might be mentioned that a large majority of the abstracts presented before the club finds its way into the abstract section of our national publications, as, for example: Dr. Robert Sonnenschein's review of hearing tests, in the Archives of Otolaryngology, and Dr. Alfred Lewy's monthly contribution to the abstract department of the same journal. It was not originally and is not now the purpose of the club to stress English literature, particularly that published in America, it being assumed that all of the members subscribe to and read such journals. However, certain members are assigned to the task of reviewing such literature and calling attention to any article that is worthy of discussion. By this means American literature is not overlooked in the club's activities.

At first it was not within the scope of the organization to review recent books; attention was called to them and there the matter ended. Later came the demand for review and criticism, and this is rapidly becoming one of the valuable features of the club. This work is exemplified in Dr. Joseph C. Beck's review of Denker and Kahler's Handbuch der Hals, Nasen ünd Ohrenheilkunde as well as of Alexander-Marburg's Handbuch "Neurologie des Ohres," which was especially gratifying. In the future more attention will be given this work, and the club will welcome the opportunity to review new editions in any language, pertaining to otolaryngology. Another feature recently added to the club's work is the presentation

of the transactions of the six national societies in our specialty, namely, American Academy of Ophthalmology and Otolaryngology; American Bronchoscopic Society; American Laryngological Association; American Laryngological, Rhinological and Otological Society; American Otological Society; and the Section of Otolaryngology of the American Medical Association.

The membership of the club has been intentionally limited, ours being twelve, since it is felt that a small membership lends informality, a better feeling of comradeship, less restraint in discussion and more satisfactory results. Very few visitors have been present at the scientific meetings. This, too, has been more or less intentional on the part of the individual members, as they realize that visitors are a greater distraction than a benefit. However, the few visitors who have been present at the meetings are genuinely enthusiastic in their praise.

An entire evening is given over to the reading club, which meets at the Medical and Dental Arts Club. The secretary arranges all details as to the dinner and meeting, sending out reminders several days previous to the meeting. Quiet surroundings are essential to the success of the work to be done. During dinner there is an informal discussion of the unusual cases that come to the attention of the members during the month. This discussion in itself is worthy of the evening. Following the dinner abstracts are presented in an entirely informal manner. As it is impossible to hear abstracts of all the articles published, the abstractor must judge the publications worthy of presentation and discussion. Each abstract is subject to informal discussion, during the course of which it may be necessary for the abstractor to refer to the original article, reading or translating the point in question. It may even be necessary for him to translate almost the entire article. Frequently references are made to tables and photographic illustrations. Occasionally a publication is so important as to warrant a complete abstract or the giving over of the entire evening to its discussion, as in the instance of Dr. Samuel Salinger's abstract of "Diagnosis and Indications for Treatment in Labyrinth Infections," by Erich Ruttin, which appeared in the Zeitschrift für Hals, Nasen und Ohrenheilkunde, Volume 18. In such a case each member is furnished with a copy of the ab-

stract for more detailed study. Despite the extensive amount of literature covered, it is seldom more than once in a year that such an article appears.

The periodicals reviewed are the following: "The Monatschrift für Ohrenheilkunde," which has been serving for a long time in Austria as the reporter of transactions of the two Viennese societies—the otologic society and the rhinolaryngologic society—whose reports, particularly on presented cases, make very valuable and practical reading. The original articles are also very good, but recently it has been noted that many articles have appeared from the pens of Soviet Russian otologists and otologists of Balkan countries which are not up to the journal's usual standard. The Monatschrift is read and reported on by Drs. Robert Sonnenschein and Alfred Lewy. "The Zeitschrift für Hals, Nasen und Ohrenheilkunde" evokes the greatest interest. It is ably handled by Drs. Harry L. Pollock and Samuel Salinger, whose abstracts with associated criticism would well merit publication. One of the journals much enjoyed is "The Acta Otolaryngologica," a periodical which presents the thoroughly prepared material of our northern European confreres in German, French and English. It appears every three months and its matter is presented by Drs. Francis L. Lederer and Joseph C. Beck. One of us, who reads both French and Italian, presents material from the following journals: "Archivio Italiano di Otologia, Rhinologia e Laringologia"; "Annals des Maladies de l'Oreille, du Larynx, du Nez et du Pharynx"; "Archives Internationales de Laryngologie, Otologie, Rhinologie et Broncho-Oesophagoscopie"; and "Revue de Laryngologie, d'Otologie et de Rhinologie." Little that appears in these journals compares favorably with that offered by the German, English or American publications. However, this fact may be due to the reader and abstractor. Another, who presents the material from "The Journal of Laryngology" (English), is pleased to note the progress that has been made in that journal since the new regime in the past few years. THE ANNALS OF OTOLOGY, RHINOLOGY AND LARYNGOLOGY is considered an efficient specialistic American journal, and its new editor and associates are to be congratulated on the publications that are appearing. The reader, Dr. L. B. Bernheimer, who is a very severe critic, makes the discussion

of these articles most enjoyable. "The Archives of Otolaryngology" stands out preeminently. The entire club are fastidious readers of this new journal whose articles merit their attention. "The Laryngoscope," which is one of our oldest American otologic publications, has been admired for the opportunity for expression presented to men away from the larger clinical centers. Dr. M. Reese Guttman does the sifting of this journal and not infrequently brings some original thought from the lesser lights in our specialty. Since the organization of the club, Dr. Henry Goldberger has presented the material offered by the "Journal of the American Medical Association." The abstract section of this publication is one of the finest in the world, in the judgment of the club. It gives one the opportunity of reviewing the world's literature. All abstracts and titles of interest to the otolaryngologist not covered by the above mentioned journals are reviewed, and not infrequently the reviewer of such abstract is requested to give a more thorough review of the original article. Finally, one of our members, Dr. Emil Deutsch, who is primarily an ophthalmologist, brings routinely to our notice borderline subjects between ophthalmology and otolaryngology from such periodicals as the "Archives of Ophthalmology."

In conclusion, we wish to commend the value of otolaryngologic reading clubs and trust that this publication will stimulate the organization of many such clubs throughout the country.

XLV.

PRESIDENT'S ADDRESS.*

By Charles W. Richardson, M. D., Sc. D.,

Washington.

It has been the accredited custom, down the past fifty years, for the succeeding presidents of this association to address you upon some one subject that appeals to him, or treat upon several topics in sequence. It becomes my pleasant duty to perform this function for you this year. For fifty years this organization has stood for the best that is in laryngology; it has been the leader in all movements that have aided in the advancement of thought and action in this specialty; it has also indicated the path that promoted investigation and standardized results. We have just passed, with pride, our semi-centennial, replete with epoch making events, and are now entering the first year of our second fifty-year existence. What the second fifty years will bring forth is somewhat nebulous at the present moment. I wish I possessed the magic wand so that I could wave back the unseen and even hazily to present it to your view. Man's work is never finished. There are fields of thought and investigation yet unthought of, which will present themselves for your investigation and elucidation. The science and art of medicine is continually progressing, and this progress alone is bringing new problems to our specialty, problems that we must be prepared to evaluate and absorb into our specialty. Much of this general medical rearrangement of newly discovered facts must be prepared for mental absorption, wherein it relates to our specialty. Those who believe our special field is now thoroughly mapped out, remind me of a Western Senator, who twenty years ago stated that all the great political problems had been solved and so he was ready to retire to his law practice. He returned to his state, and since then the great world war has taken place, with all of its reconstruction problems.

*Read before the American Laryngological Association, Atlantic City, May 20, 1929.

It is interesting to trace the course of this great specialty since the creation of this association. What an evolution in the progress of medicine is now revealed to us! Our earlier workers spent their activities in the study of diseases of the pharynx and larynx. Most of their learned brochures were theoretical dissertations on the function of the larynx, and the practical discussion of affections of these organs. How well we remember that remarkable thesis by John Mackenzie on the Massacre of the Tonsils. In the late seventies and the early eighties we had an enlargement in our field of activities. Largely through a more thorough study of the anatomy and pathology of the nose and its sinuses, but influenced to a fair extent by the discovery of the anesthetic properties of cocain, we ventured boldly upon this new field of investigation and study. With the advent of cocain, we had imparted to us a greater impetus to the more intensive study and more thorough elucidation of diseases of the nasal chambers and their adnexa. Further progress in extending our knowledge of the anatomy, its anomalies and pathology added to and kept us abreast of our clinical information. Local anesthesia led to the improvement of our technic and calmer operative treatment of these areas. Almost immediately thereafter the placing of the adrenal active principle at our behest added materially in the conquering of this portion of the upper air tract. I use the term conquering only in a relative sense. The next great advancement of our specialty was the application of endoscopy to air and food passages. The technic of the introduction of the long, straight, rigid tubes into the air and food passages was quickly acquired. So Elberg's prophecy has become complete. Our specialty has now a nearly complete survey of the whole respiratory tract, a complete survey of the food passages and an insight into the digestive tract.

Numerous workers in the field of laryngology are now extending and enlarging our field of information within the extensive area to which our survey has led us. Much yet has to be done in the clarifying of our information, to a thorough appreciation of our pathology, to applying the proper therapeutic measures and operative technic, the crystallizing of facts into knowledge, and to coordinate and standardize our results.

In the intensive work in the field in which we are engaged, have we not grown a little narrow, and have we not lost, in a degree, our relation to the body and its affections as a whole? Are we as keen in preventive medicine as we should be; are we keeping in touch as thoroughly as we should with the great progress in all branches of clinical medicine? Let each of us study these questions in the quietude of his own consciousness.

In presenting a paper on the subject of "Vasomotor Rhinitis," in 1911, at the Philadelphia meeting of this association, I called attention to the fact that a thorough knowledge of this subject would be attained only through the aid of the biochemist. Through the aid of the biochemist many features of this disturbance are better understood. The question of allergy is playing an important part in the therapeutic study of this phenomenon. Yet the occurrence of heredity, of cellular changes and other statements do not, to many minds, explain the overwhelming question of why certain individuals, otherwise apparently normal, are affected by certain protein substances while others are immune. Is this question of cause and effect to be elucidated by the allergist or through the endeavors of the nutritional scientist? Angioneurotic edema, which presents itself to us in unpleasant aspect when affecting the upper air tract, is another border relationship which invites our consideration and thorough study.

Dr. William Osler, whom we all like to quote, has stated that "ninety per cent of all conditions other than acute infections, contagious diseases and traumatism are directly traceable to diet." All accept the fact that a man is, according to the type of food he eats. We know that animals maintain themselves in perfect health through the eating of their natural foods. Deficiency in, or absence of certain natural food supplies, result in impaired growth, with illness, and if prolonged may be attended with death. We have known for a long time that deficiency of certain food elements over prolonged periods has been attended with certain types of illness in the human body. Empirically we have been able to meet such conditions heretofore incompletely in man; but many relations with disease of less disastrous nature, due to deficiency in food elements; the relationship of food to these disturbances, and the cause thereof, have only in the past few years been brought

more impressively to our consideration. Many disturbances which we thought due to infection or other causes have been demonstrated to be due to deficiency in certain elements of food; and deficiency in certain elements of diet has been in other circumstances the predisposing cause of certain types of infection.

Anyone who has had the pleasure of reading Dr. Robert McCarrison's "Studies on Deficiency Diet" cannot but be impressed with the marked influence of food as a factor in health or its deficiency as a factor in disease. I had the pleasure of entertaining Dr. McCarrison as a house guest when he was a visitor in Washington, and I spent many hours with him studying his specimens and photographs. The changes produced in the alimentary canal and in the mucous lining thereof, was most impressive to me, in protracted moderate deficiency. How these changes leading to atrophy and disintegration of glandular structures must influence the basal metabolism can be readily pictured, without even taking into consideration the concurrent changes produced in the ductless glands. Numerous workers in biochemistry and nutrition in this country and abroad have brought to us a mass of information pregnant with relationship to our specialty which should not be overlooked. Dr. McCarrison most vividly pictured the subject in the following quotation:

"Lack of vitamins disturbs calcium metabolism; it puts an end to regenerative process; it involves with respect to the cells of higher function the functional depression of the many, the death and failure of regeneration of the few. Its cardinal effect is depreciation of cellular function; the depreciation of cellular function is the foundation upon which disease is built. Extreme deprivation means rapid dissolution and death; partial deprivation means slow dissolution and disease."

Dr. William Watson, writing on this subject, places the science of nutrition as one of the basic sciences. He says:

"Among the most important of the recent additions have been physiologic chemistry and biologic chemistry. The subjects have in turn become incorporated into the science of nutrition. It is the development in this science that we must diligently follow, because from the standpoint of human interest the most fundamental of all sciences. Regardless of

what branch of medicine we have cast our lot in or where we have directed our interest, there are two conditions—growth and development—that must always remain subjects of our concern."

The science of nutrition has made such advancement during the past ten years, and its relation to our special field is so impelling that your council decided to make it, so far as it pertains to our specialty, directly or indirectly, the subject for your symposium at this meeting. Topics of this nature, which can be fairly understood by the average layman, are being extensively heralded both in the medical and lay press. The manufacturers of various types of food products are flooding the secular press with their advertisements, claiming special virtues for their products. The potential value of their products is claimed on account of their polyvalent vitamin contents or the possession of one vitamin in superior quantity or quality. The term vitamin has caught the public eye, and the energetic advertising agent is playing upon the word to the advantage of his manufacture. It seems, therefore, incumbent upon this association to consider this subject in its various phases.

There is one article of food which enters into our dietary which will not be, in all probability, considered by those participating in the symposium but which I feel should be given serious consideration, and that is sugar. No doubt every member of this association has seen many cases of disturbances of the upper air tract directly due to excessive or inordinate use of sugar products. During the past twenty-five years the consumption of sugar by the American people has increased enormously. The per capita consumption of sugar by the inhabitants of the United States is now 105 pounds annually. We all know that sugar is a great energizer, and we are all aware of the fact that it lacks minerals, vitamins, proteins and roughage. A moderate amount of sugar taken with food and in desserts is wholesome; but when used frequently, between meals and in excess, it is detrimental to the well being. Taken between meals and in excess it lessens the appetite for an intake of those foods which are essential for growth and repair of the body. In children this condition is most marked. In children, habituated to the excess and continuous use of candy, "sweets" and soda fountain drinks between meals, do we have

a gradual production of a deficiency diet. Those foods essential to their growth and development, containing essential vitamins, become repugnant to them. I am sure you have all found children with obstructed nasal passages, congested and irritated pharynges and violent night coughs, whose histories will give you evidence of dislike for fats, succulent vegetables, fruits, meats and milk; and accompanying gastrointestinal disturbances and marked constipation. Fermentation is set up in the alimentary canal, with the production of a more or less intestinal toxemia. Through the deficiency diet, intestinal toxemia, the disturbed metabolism and the impaired enervation of the splanchnic sympathetic, we have as a result those vasomotor disturbances we see frequently in children and young adults. Limiting the ingestion of sugar, cutting out its ingestion between meals, and substituting a rational diet has brought about quicker and more permanent restoration than through any other means that I have ever seen employed to overcome these conditions.

In the past few years I have been impressed with the fact that so many of our junior specialists are embarking on their lifework in our specialty without an adequate grounding in general clinical medicine. I am impressed quite as frequently with the fact that when possessed with a fair amount of this knowledge they proceed to forget it or neglect to apply it. There is no fact so patent as that application of one's energies in a limited field of endeavor is apt to blunt one's maintenance of his knowledge of general medicine, and diminish his efforts to enlarge his information along the field of general medicine of which his specialty is only a part. This is not only apparent in our art but is common to all fields of endeavor. One must force the faltering interest, not only to keep that which he possesses but to acquire new information and keep abreast of the rapid progress being made in general medicine. We of this association must through our actions, precept and teaching impress upon our juniors the importance of keeping up with the trend in general medicine.

I have been informed by one of the examiners in the Otolaryngological Board that the inadequacy in the application of general clinical medical knowledge in its relation to our specialty of some of those coming before the board for their certificates in

otolaryngology is distressing. Unless some method is adopted to correct this evil among our junior men it will become necessary, by means of a barrier, to disassociate the region above the neck from the remainder of the human body. I have no suggestion to make to the board with regard to this failure among some of the applicants for their certificates, as I feel that they have accomplished wonders in the work that they have undertaken, and that they will be able to cope with this delinquency. They need our support in correcting this condition and for that purpose I call it to your attention. Indeed, I fear we do not realize the remarkable work these gentlemen are doing, in such a self sacrificing manner, for the good of the science and art of medicine and for humanity. I certainly feel that we are faint in our praise of them. I hope some action evidencing our loyalty and praise of them for their well done work will come from this association.

During the past year we have been called upon to mourn the death of an unusually large number of our membership. Men distinguished in medicine, as well as in our specialty. Those deceased among our active fellows were Drs. Greenfield Sluder, and Leon E. White; Drs. Jonathan Wright and Thomas R. French, honorary fellows; Drs. Holger Mygind, Charles E. deM. Sajous, Marcel Lermoye, Greville MacDonald and Gherardo Ferreri, corresponding fellows. What a myriad of pleasant recollections and delightful associations we all recall in connection with the memories of this galaxy of brilliant men. Dr. D. Bryson Delavan will epitomize their personal and medical histories at a subsequent session of this meeting. I cannot close these few remarks to you without expressing to the members of the American Laryngological Association my appreciation of the honor you have conferred upon me by electing me your President.

In the name of the Association, I bid you welcome to the fifty-first annual meeting of the American Laryngological Association.

I now declare this meeting open for the transaction of business.

XLVI.

SINUSITIS IN CHILDREN.*

By J. Mackenzie Brown, M. D.,

Los Angeles.

The ethmoid sinuses are present at birth as small but distinct cells. The maxillary sinuses are also present at birth, each the size of a pea, and are placed medially and below the orbit. In children under three years the floor of the antrum rarely extends below the level of the attachment of the inferior turbinate, which prompts Shaefer to recommend puncturing above instead of below the inferior turbinate. The buds of the second teeth are placed under and lateral to the antra, and one must be exceedingly careful in any procedure in or around the antrum not to injure them. Injury to a tooth bud could easily cause it to be displaced from its normal position in its crypt and prevent its normal development and eruption. Such a bud could become cystic. The frontal sinuses are rarely of clinical importance before the eighth year. The sphenoid sinuses at birth are but faint depressions in the bodies of the sphenoid bones. They are of little significance before the third or fourth year. Norval Pierce draws attention to the fact that in the infant the nasal mucosa is thick, lies in folds and may retain infection as do the sinuses. The sinuses vary greatly in size, shape, location and development, and probably more anomalies are found here than in any other part of the body. These facts must always be taken into consideration when they are surgically considered.

Mitchell, who made a careful study of 145 cases of sinusitis, found ethmoid involvement in all; antra involved 84 cases, sphenoids and frontals involved 2 cases each.

There are two main types: suppurative and hyperplastic. In the latter type there is little or no pus formation, but there exists an increase in cells. In children I have found this latter class infrequently.

*Read before the Western Section of the American Otological, Rhinological and Laryngological Society, Santa Barbara, Calif., April 21, 1928.

A large percentage of the cases that I have seen have definite allergic reactions and quite a few show the same allergic characteristics in the nose, but have not given any definite allergic reactions. These I call "near-allergic," or vasomotor rhinitis. These youngsters have a pale thickened nasal mucosa that responds very easily to the slightest change in temperature, moisture, dust, etc. This mucosa produces the proper condition for the development at any time of a sinusitis—that is, obstruction, poor aeration and poor drainage of the nose and sinuses. (2) Tonsils and adenoids: These predispose in two ways, (a) mechanical obstruction to nasal respiration, and (b) the presence of infections in both, which in turn often infects by contiguity or to lower the general resistance of the child so that he is less immune to infection. (3) Poor health, especially from improper diet, lowers the resistance, thereby allowing repeated nasal infection. Drs. Dean of Iowa and Smith of Yale say that a diet deficient in fat vitamine and a deficiency in a general balanced diet both tend to produce a disturbance in antibody formation. (4) Anatomical defects within the nose, such as a deflected septum, producing a lack of proper aeration and drainage of one or more sinuses, is also a predisposing factor. Shaefer reports deflection of the septum before birth and we see it frequently in children from falls on the nose.

Acute respiratory infections, (b) acute infections of childhood, such as measles, whooping cough, scarlet fever, diphtheria and influenza, are immediate causes of sinusitis in children. Dr. F. W. White of New York, in reviewing fifty cases of sinusitis in children, found that forty had had pertusis or measles as the beginning of their trouble in the sinuses. I have noticed a marked increase in sinusitis since the influenza epidemic of ten years ago, and each succeeding occurrence of this disease brings on an epidemic of sinusitis.

Practically all of the cases I see in the summer vacation give a history of swimming one to three or four days prior to the sinusitis. There are two ways by which the sinuses become infected: (a) by having the infected water go directly into the nose and sinuses, (b) by washing infection from the already infected nasal mucosa, as in an acute rhinitis, into the sinuses, washing from one sinus into another or washing in-

fection from tonsils or adenoids into the sinuses. Dr. Ralph Fenton says that this is aided by the following factors: "The destructive action of water on the cells causing edema, loss of ciliary activity and death; also, washing away any of the natural secretions which are inhibitions to bacterial growth, either from his own nose or throat or from the pool." He adds to this, "the trauma to the nasal mucosa from the forcible inrush of water, especially when chlorinated, and the outrush of air bubbles." Such conditions are ideal for the growth of pathogenic bacteria, either from the nose or throat or from the pool; add to this the chilling of the body if the water is cold, or coming out of a warm pool and lying in a wet bathing suit so that the body becomes thoroughly chilled, and you have the ideal conditions for the development of sinusitis. Dr. Marshall Taylor, chairman of the committee on swimming pools of the A. M. A., from his investigations, says that the infections of the sinuses are produced mainly from self-infection and less often from pool infection. He further advises against long periods of swimming in cold water, which produce the lowered body resistance and the nasal changes which tend to change an inactive nasal infection into an active infection. Dr. F. E. Hasty conducted several interesting experiments by throwing charcoal (powdered) into a swimming pool and had several boys swim in the pool. He then carefully examined each boy's nose and found charcoal deposits on every part of the nasal mucosa.

Frequent "colds," with a profuse discharge of mucus, mucopurulent or purulent secretion from the anterior or posterior nares, is the most constant symptom. The mucus discharge is present in hyperplastic sinusitis, and the mucopurulent and purulent in the suppurative type. The possibility of the presence of a foreign body should always be considered in patients having a one-sided purulent discharge, nasal obstruction and mouth breathing, and sneezing spells simulating hay fever, particularly the perennial type. Thickening of the pharyngeal mucosa, especially the lateral bands and the formation of lymphoid patches and the return of adenoids, is frequently seen. Cervical adenitis is fairly constant. Chronic laryngitis with attacks of croup are not uncommon. One of the most frequent complaints is cough; this is usually of the spasmodic type,

simulating whooping cough, and is more pronounced at night. You have little or no chest findings in these cases. Chronic bronchitis and bronchiectasis and attacks of asthma are not uncommon. Acute and chronic inflammations of the middle ear are common. Meckel's ganglion is frequently irritated, producing pain in the face and head on the affected side. Headache is a very frequent symptom. Temperature is often 99° or above in the afternoon, and extending over periods of weeks or months. Eye lesions are numerous, such as conjunctivitis, keratitis, etc. When orbital cellulitis is present it is nearly always indicative of a sinus becoming closed and seeking the line of least resistance through the orbit. Systematic complications that sinusitis cause are gastrointestinal disturbances, especially the "cholera infantum" type, and occasionally such secondary complications as nephritis, pyelitis, arthritis, cardiac lesions, anemia and chorea.

Careful inspection of the nose before and after shrinking of the mucous membrane will disclose the presence of pus and polypi and the condition of the mucosa itself. Pus may be seen coming from the posterior nares with the aid of the pharyngeal mirror. The Holmes nasopharyngoscope is very useful to discover pus and its source in older children. Washing the nose after careful shrinking will often produce pus when inspection fails. Cultures from the antrum should be made in doubtful cases. Transillumination is helpful but is very unreliable, owing to the varying thicknesses of the bony walls of the sinuses and the thickness of the antral floor. I regard X-ray as the greatest help we have. It gives us the size and location of each sinus and its pathology. This requires great care on the part of the roentgenologist. X-rays should always be taken when operative measures are contemplated. The course of any sinusitis depends upon the efficiency of the treatment and the child's general condition and surroundings, with climate as an important factor.

The careful selection of swimming pools and short periods of swimming, especially in cold water, are important preventive measures. Children should not be allowed to swim when there is any infection in the ears, nose or throat. All cases presenting allergic symptoms should be tested and positive cases treated. Vaccines are often successful in the prevention of colds.

The anatomic defects should be corrected in suitable cases. Colds may be prevented by proper diet, suitable clothing, well-ventilated sleeping quarters, and cold baths followed by a vigorous rub and proper exercise.

The treatment of these cases requires the combined resources of the pediatrician, rhinologist and the family, for once a sinus has become infected the predisposition is there and recurrences are common. (a) Tonsils and adenoids should be removed. Dean reports that 90 per cent of his cases are cured by this procedure. The removal of the adenoids alone is not sufficient. (b) Proper diet is essential. (c) Sunshine, sun baths and various lights are of great benefit. (d) According to Fenton and Coates, vaccines are often beneficial, and in a few cases they have been of great value to me. Vaccines are of greatest value to prevent the acute reinfections. I find that if you can prevent the acute infections, the chronic infection has a chance to get well, but if you have repeated reinfections of the nose and sinuses the chronic condition has a tendency to remain. They will get better with treatments in the intervals, but at the onset of an acute infection the old infection returns to its former severity. The commonest organism found is the staphylococcus, and this organism in turn is the most amenable to vaccine therapy. (e) The sleeping room should not have a direct draft over the patient, and when the child with a sinusitis is attending school he should not be allowed to participate in gymnastics. Many sinuses will clear up with no other treatment than having the patient move to a warm, dry climate, such as the California or Arizona desert. The dry, warm air produces in the nose the maximum amount of room, which is the ideal condition for constant drainage of the sinuses. If the sinuses can be drained constantly by climatic or other means, they will get well, and I know of no better method of producing this than is offered by our desert country. It is, however, very necessary that one have comfortable surroundings, as the desert climate is subject to sudden changes, and if the patient is not housed properly he may undo in a few hours what he has gained in many weeks. (f) Shrink the nasal mucosa with ephedrine and wash the nose with a warm saline. Follow this with a mild antiseptic, such as neosilvol, argyrol or mercurochrome. In the use of these remedies, I

would suggest that after shrinking the nose cotton pledgets soaked in the medicine be placed high up in the nares and allowed to remain several minutes. Suction after shrinking is of value in treating older children. Washing an infected antrum a few times will often produce suprising results. If an infected sinus does not respond to washings, suitable drainage and ventilation should be established by means of a window in the antrum. I believe one should hesitate a long time before doing any surgery on the sinuses of children other than a small window in the antrum, and especially radical surgery, unless there are complications that demand immediate relief. Again, the treatment depends upon the cooperation of pediatrician, rhinologist, family and child, and great care as to detail will bring results.

Prognosis: Chronic sinusitis in children, when recognized and properly treated, has a very good prognosis. Lillie says that 98 per cent are cured by treatment.

I wish to add my appreciation to the wonderful work done in the anatomy of the sinuses by Parsons Schaeffer, W. B. Davis and to Norval Pierce; also, to Dean and his associates of Iowa in the clinical considerations.

XLVII.

AN ANALYSIS OF FIVE HUNDRED TONSIL-LECTOMIES.

By M. C. Comer, M. D.,

Tucson, Arizona.

In selecting the material for this manuscript I reviewed my records from April 1, 1927, and took each case as it came until 500 cases were tabulated. That the tabulation should show exactly 200 adult cases and 300 children is a coincidence, but we think this proportion of 3 to 2 normal in our clinic.

Those engaged in research work regarding the tonsil are diligently seeking the truth concerning this gland and the remote results attending its total removal.

The surgery of the tonsil has been perfected beyond hope of much improvement, but science is not yet satisfied that this procedure is entirely without risk to the individual's well-being or to the development of the race.

In regard to the function of the tonsil, this is thoroughly discussed by James Harper in an article in the Glasgow Medical Journal, Vol. XCIV, and to my mind, is the best that has appeared on this subject in many years.

His conclusions are sharply drawn and straight to the point. Three sentences from this manuscript sum up the present status of the tonsil:

First, "No specialized cells go to form the tonsil, it being chiefly a collection of lymphoid tissue differing in no way from that of other lymphoid tissue in the body."

Second, "Nothing in the development of the tonsil or its phylogenetic connection has been found which points to it being an internal secretory gland."

And finally, "Should the tonsil have any function beyond that common to lymphatic tissue in other parts of the body, it would be natural to expect some change in the individual by loss of such function."

Many patients come to us complaining of pain in the chest, shoulder and arm, diagnosed usually as neuritis, due to focal infection. I have never been able to accept this diagnosis as correct. The symptoms are too evanescent and the pain does not resemble in any way a true neuritis except for the discomfort. Neuritis is intolerant to pressure and hypersensitive to thermal changes, while in this condition pressure over certain arterial trunks seems to give some relief, and temperature changes have no effect.

I am satisfied that the condition is purely a sympathetic phenomenon, in which belief Drs. W. B. Coffey and John D. Humber of San Francisco are in agreement.

I recall one patient in particular who seemed to be in great agony with severe pain in the left arm, so much so, indeed, that he paid but little attention to my manipulations in his throat. I removed the left tonsil first and with its removal the pain disappeared and did not return.

Another patient, suffering with pain in the cervical region and shoulder plus chronic tonsillitis, had her tonsils removed with no improvement, but when later a badly impacted wisdom tooth was extracted the pain ceased. In solving this problem my mind has been relieved of a burden of doubt—a doubt that the toxins from a tonsillar infection could have any such selective action as would be implied were these pains due to neuritis. The proposition resolves itself merely into a point of irritation plus reflex pain through the sympathetics, this point of irritation being caused by either infection, traumatism or pressure. A tonsillolith, acting as a foreign body with consequent insult to the tissues or an impacted wisdom tooth through constant pressure, may be sufficient to produce this extremely annoying group of symptoms.

Patients demand treatment when their throats are infected and we are justified in using whatever palliative treatment we may choose at the time. Acute tonsillitis is self limited and will get well without treatment. In the chronic type with hypertrophy, the X-ray will reduce the lymphoid tissue but does not affect the invading organism.

A tonsil once infected remains pathologic until it is properly removed.

Emptying the crypts of accumulated débris, of course, facilitates drainage, but no treatment directed to these recesses will sterilize them.

Rough instrumentation should certainly be avoided and the use of the cautery must be condemned.

A proper examination of the tonsil is never complete unless pressure is made on the anterior pillar in such manner that the tonsil is turned out into the throat, bringing into view any evidence of hidden infection.

The purplish red appearance of the faucial pillars, frequent attacks of pharyngitis and tonsillitis, coupled with those remote symptoms usual to focal infections, lead us unerringly to a correct diagnosis, with more assurance of definite improvement after operation than in most of our medicochirurgic problems.

There have been many reports of deaths as a result of the anesthetic preceding or hemorrhage following the operation for the removal of the tonsils. It is essentially a major procedure and should be handled as such.

No tonsil should be removed after an acute inflammation until two or three weeks have passed, and in those cases wherein the streptococcus predominates, six weeks.

My experience with the tuberculous patient leads me to believe that in most cases pulmonary tuberculosis, both active and arrested, should be regarded as a contraindication to tonsillectomy. The recently arrested case in particular demands very serious consideration, if we would avoid disturbance of that delicate equilibrium between illness and health so common to these patients who after months or years have won their battle but still require time and the most favorable circumstances in which to stabilize their position.

Examining the following graphic chart of 200 tonsillectomies from the age of 16 to 65 years (Fig. 1), we note certain high points, the highest being 17 operations at age 23. From 16 to 20 the number of operations in each is fairly constant, with an abrupt drop at age 21 and again at 24. We note another jump at 26, a drop at 27 and a rise at 29, from which point there is a consistent but gradual drop. We see a sudden jump at 42 and a drop at 43, with no other rise of

importance. The ages of 23 and 42 stand out because of the marked disproportion in number as compared to those ages immediately proximal to them.

Is it fair to explain this by saying that individuals at 23 and 42 are more impressionable and therefore more easily persuaded than those of younger or older ages, or would you say that people at these ages are more introspective and more prone to complain? These two ages represent the thresholds of separate epochs in the life history of the individual, and I believe the only tenable hypothesis to be that based upon a possible lack of resistance peculiar to these periods.

Referring now to the graphic chart of 300 tonsillectomies in children between the ages of 18 months and 15 years (Fig. 2), we find the only thing of note to be the high point at the age of six. This is accounted for by the fact that the school inspections catch them first at this age.

All children are operated upon under ether. Of the 200 adults, 39 took ether and 161 chose local anesthesia. In both adults and children we have, as to method: Sluder method—Adults, 144; children, 286. Dissection and snare—Adults, 56; children, 14.

Those listed under the Sluder method are those wherein no other instrument was used. Any case wherein any part of the tonsil was dissected or snared out is listed under that heading.

I am an enthusiast in regard to the La Force Sluder instrument, both for local and general work. It is especially good for local work, in that we have many cases with absolutely no hemorrhage, and I feel that the patient's morale is benefited materially thereby. Should there be some pressure pain, it is only momentary. The patient's greatest anxiety is brought about by a doubt as to whether he will be able to tolerate the instrument over a period of three to five minutes, but he is agreeably surprised by the slight discomfort experienced.

LOCAL ANESTHESIA.

Out of two hundred adult tonsillectomies listed you will note that 161 were done under local anesthesia. This is a fair proportion and is a good index for this class of cases. The tendency is to get away from general anesthesia in adults, and if it were not for the foreign element in our population it would

not be necessary to do more than one out of twenty operations in adults under ether anesthesia. The peon class of Mexicans should never be operated upon under local anesthesia, but the higher class or true Spanish types make wonderful patients. However, we have no set rule as to when local anesthesia should be used, the patient usually being allowed his preference. The minimum age we set at 16 years in boys, and 17 to 18 years in girls. Young girls have a tendency to panic and hysteria and, due to their unstable nervous systems, are not easily controlled.

Cocain is contraindicated in operations upon children, a few drops of this drug in the eye of a ten to twelve year old child being capable of causing an alarming syncope. Then we have the individual who is unable to distinguish between pressure and pain, and complains bitterly at the time of operation only to admit when back in bed that he had not been hurt. Different individuals exhibit a wide variance in degree of sensitiveness to pain. We have an excellent method of determining the degree of sensitiveness, and this, or some other method should be used before subjecting anyone to local anesthesia. This method of eliciting pain by varying degree of pressure over the tip of the mastoid, is described by Dr. Emmanuel Libman in the 1926 proceedings of the Post Graduate Assembly of North America, page 60.

Beware of the "psychologic gagger," with his thick, muscular, uncontrollable tongue, for he will play havoc with your self confidence and render your memories of a successful local tonsillectomy exceedingly dim.

My method of infiltration for a local anesthetic is somewhat different from that used by most operators, and I have seen it used by but one other man, and he a general surgeon.

I make one injection above the superior plica, into the posterior palatine nerve, and then two submucous injections into the anterior pillar and one into the posterior. Then grasping the tonsil and pulling it out into the throat, I am able to more easily pass the needle back of the gland and infiltrate the tissues in this region. This manipulation has a certain value in demonstrating the mobility of the tonsil and I am thus able to judge whether the Sluder instrument can be used successfully.

COAGULATION TESTS.

We make a coagulation test on all adults, using the capillary tube method. Its value I seriously question but still it gives a comforting sense of safety to know that the coagulation time is well within the normal limits of three to seven minutes.

A clinical history ruling out hemophiliac tendencies is of far more value to the operator, and a careful quizzing will certainly bring out the facts as to whether the patient is a true bleeder.

It was my misfortune in the early days of my work to operate upon a true hemophiliac. He was referred to me with a diagnosis of articular rheumatism, when in fact he had hemophilic joints.

This boy was 22 years of age and did not know that he was a bleeder. I worked with him two whole weeks, seeing him at three-hour intervals, before his bleeding finally stopped. Of course, his rheumatism was not improved by the operation.

In the series of cases presented, our coagulation tests showed a time range from three to fifteen minutes. To all cases with a coagulation time over seven minutes we gave calcium lactate with parathyroid for one week or until the coagulation time approached normal.

I do not think it necessary or advisable to take the coagulation test on children. The contractility of the tissues is far more marked at this age, and I have never seen a serious hemorrhage following tonsillectomy on a child, in which the proper technic was used.

CAUSES OF POSTOPERATIVE HEMORRHAGE.

There are two well defined reasons for all of the hemorrhages encountered after removal of the tonsils.

1. The tonsil is not fully enucleated, and a portion of the tonsil and capsule remains.

2. The operator has carried his dissection too deep and destroyed a part of the cervical fascia and superior constrictor muscle.

In a recent letter Dr. Lynch advises me that his conclusions regarding postoperative hemorrhages are as follows:

"The tonsil is made up of lymphoid and white fiber connective tissue, the latter being arranged in trabeculæ which extend

from the base of the tonsil to the surface. The vessels in their divisions pass through the superior constrictor muscle and fascia, and after entering the tonsil pass along these trabeculæ. When a portion of the tonsil is left, the severed trabeculæ, having no power of contraction, hold the mouths of the vessels open and we have immediate hemorrhage or, after undue strain upon the tissues, the clot may be forced out from the vessel and a secondary hemorrhage occur a few hours after operation. Those hemorrhages occurring from the seventh to the tenth day are due to one of two things: First, a tonsil stump or remnant is essentially of poor resistance and infection is the rule. This infection travels down through the tonsil tissue to its capsule and there ulcerates through the base, leaving the mouth of the vessel wide open. Second, if the dissection is such as to extend down into the muscle tissue, and infection occurs in this area, the resulting slough produced by the infection will weaken the walls of the veins, and since they are, in this location, near the trunks of the main vessel, hemorrhage results."

Immediate and continued hemorrhage caused by too deep dissection is explained by the fact that the severed vessels, being so near the main trunks, are unable to retract and invaginate, the clot is too short and is therefore insufficiently firm to resist the pressure both from within and without. This, coupled with the loss of the third factor in hemostasis, namely, the contraction of the tissues surrounding the vessel, renders bleeding a certainty.

We must stay within the areolar tissue back of the tonsil capsule and in front of the cervical fascia covering the superior constrictor muscle.

In older people we have to consider high blood pressure and atheromatous vessels. Hemorrhage from the adenoid region or epipharynx is due either to shreds of mucous membrane or to the wounding of a large venous plexus.

In the presence of real hemorrhage I have never found any of the coagulating preparations of the least value. Bleeding vessels should be tied. Tincture of benzoin compound will serve in cases where there is slight oozing. Hemorrhage after five or six days is usually due to infection. If the clot is re-

moved and the fossa subjected to a rough sponging, most of these late hemorrhages can be checked.

In the 500 cases under discussion I had but eighteen hemorrhages, these occurring with six exceptions, in adults. In none of these cases were the hemorrhages severe, except the three cases in children who bled from the epipharynx. Two of these cases were twin sisters, fifteen years of age. One of these sisters started to bleed two hours after operation, and the other on the seventh day. In six cases vessels were tied at operation, more as a precaution than for any real need. One child hemorrhaged after three hours, one after six hours, one on the fifth day and two on the sixth day. Twelve of these patients were operated upon under ether and six with local anesthesia. Of the fifteen tonsil hemorrhages, six were dissection cases and the other nine had their tonsils removed with the Sluder instrument. Should the tonsils be removed in the presence of a subacute inflammation, hemorrhage of the oozing type may be expected. This bleeding is due to the vascular dilatation usual to subacute or chronic inflammatory processes and is characterized by an oozing coming from everywhere in the fossa, with the slow formation of clots, which on removal open up the vessels and the process is repeated. Unless the patient is actually losing a great amount of blood, which is unusual, these throats should be let alone.

Suturing packs into the fossæ or the use of clamps is a very painful procedure, and usually spells uneasiness on the part of the surgeon. A hypodermic of morphin will in most instances solve the problem and the patient be spared the painful experience of what is so often misdirected effort in the control of hemorrhage, which, in itself, is of little consequence.

COMPLICATIONS AND ACCIDENTS.

I have seen at least one example of most of the complications that may occur in removal of the tonsils. Up to this date I have not had a single case of pulmonary abscess follow a tonsillectomy.

Tonsilloliths are more common than supposed, if we but look well for them. Aberrant vessels coursing their way across the fossæ or pulsating behind the posterior pillar bring forth a prayer of thanksgiving that our knife had not slipped, and we

are strongly impressed with the fact that there is more than one reason why we should avoid mutilation of the throat. Paralysis of the palatal muscles occurs but fortunately is only a temporary affair. We see tonsils large and small—some weighing as much as eleven grams and others degenerated to mere cysts containing sterile pus. In the series of 300 cases of children in this report, five developed German measles after operation, but recovery was otherwise uneventful. Delayed healing, I have found to be the rule in patients over 50 years of age, and they complain of discomfort for a period of months following the operation. It is almost a useless procedure at this age, and I have never had a patient of 50 and past that would admit any improvement either in the throat or the remote symptoms for which he was operated upon.

I like to wait until the third or fourth year in children before removing the tonsils, not because of the added danger under that age from enlarged thymus and the anesthetic, but because the throat is small, the gland soft and friable, and a clean operation rendered that much more uncertain. Pyelitis, recurrent tonsillitis, otitis media and failure to gain weight call for interference, even at one year, and your results are positive and gratifying both to the parents and yourself. It is remarkable how little these children complain after operation. The tonsil never returns after thorough removal, and when any part of the gland apparently reappears then you should acknowledge without any equivocation that your operation was incomplete, regardless of what you may think necessary to tell the patient. The presence of a tonsil remnant is of no consequence unless proved infected.

FOOD ALLERGY.

There is no other operation in the domain of surgery which more insistently demands a knowledge of the patient's toleration for the different foods which might be used in the postoperative period. Should the patient be sensitized to cows' milk its ingestion may produce an alarming edema of the throat and larynx. Honey in some cases causes most intense pain, radiating to the back of the neck and cervical region. Strawberries, apricots, etc., may produce all the symptoms usual to allergy—i. e., edema, urticaria and diarrhea.

Novocain allergy may explain in great degree the excessive edema of palate, uvula and pillars noted in certain cases. Syncope soon after infiltration with novocain and adrenalin may or may not be due to the adrenalin but is frequently due to the novocain.

FOOD AND WATER.

After operations upon the throat it is very necessary that the patient's water and food intake be kept at a normal level. If this is done, the patient does not become dehydrated, has no acidosis, keeps his strength and normal resistance and recovers with a minimum of discomfort. It is not sufficient to direct the adult patients to eat and drink—they must have help.

Postural treatment as an aid to deglutition I have abandoned, feeling that it serves only to magnify the gravity of the patient's condition and increases his desire for sympathy. Instead I have found sound psychology, practiced as best to encourage and support, coupled with aspirin in five to ten grain doses, thirty or forty minutes before meals, indispensable items in the making of grateful postoperative patients.

XLVIII.

GHERARDO FERRERI.

(November 15, 1856—January 22, 1929)

On January 22, 1929, occurred in Rome the unexpected death of Professor Gherardo Ferreri, Director of the Oto-Rhino-Laryngologic Clinic of the University.

Gherardo Ferreri was born in Cuneo on the 15th of November, 1856. He performed the classical studies in Rome; and from the University of Rome he received the degree cum laude in medicine and surgery in 1880. While still a student in the sixth year, he became, through competitive examination, Adjunct in Surgery in the Hospitals of Rome; and also by competitive examination he was elected in 1883 Assistant in Surgery, an office which he filled until 1888. He alternated his hospital services with the duties of Municipal Doctor, until in 1882 he became Doctor of the Community of Rome, a position which he continued to hold until he assumed the chair.

An admirer of Emilio De Rossi, the founder of Otology in Italy, Ferreri followed him from his first years of teaching and became his Assistant in 1888, and later was his Associate until 1900. He obtained the "libera docenza"* in Oto-Rhino-Larngology in 1896. He succeeded his master as an acting professor, and then as Professor Extraordinary in 1903. He was given the chair of the Oto-Rhino-Laryngologic Clinic in 1906.

His scientific production, initiated in 1883 with papers on general surgery, never slackened; on the contrary, it became more intensive with the passage of time.

The character of his works is pre-eminently clinical, when one understands as being clinical all the complex of medical and surgical ideas. Therefore from his observations, accompanied by his anatomico-pathological investigations, by labora-

*Libera docenza is a degree conferred upon a doctor who has performed a certain amount of practical and original work in the specialty of his choice. He then assumes the title of "Professor."

tory research, very often by experimental methods, have arisen chapters of personal character, like his works upon the deafness of childhood and youth, upon otosclerosis, intracranial complications of otitic origin, lesions of the sinuses of the face, upon tuberculosis, tumors of the larynx, studies of phonetics, etc.

From the time of his appointment to the chair he published the *Transactions of the Oto-Rhino-Laryngoiatric Clinic of Rome*, which now in its XXVI volume, contains a very large number of original investigations and studies, and demonstrates the fruitful activity of his school.

From the beginning until three years ago he was Editor-in-Chief of the *Italian Archives of Otology*, continuing to be an active contributor. After the death of Massei, he took the direction of the *Italian Archives of Laryngology*.

He published papers not only along scientific lines, but also dealt with Sociology and Social Medicine; intent at all times upon improving and elevating the race.

He was one of the ardent and unselfish apostles in the struggle against tuberculosis. A lover of the surgical art, he was unsurpassed in the exposition and perfection in Italy of the operative technique of his specialty, making many improvements and originating also numerous instruments and operative procedures.

He wrote, moreover, brilliant articles, particularly of scholastic nature, in political journals and reviews.

But above all he was devoted to his School, to which he gave the best that was in him; and he had the satisfaction of seeing himself, during his maturity and in his vigorous old age, surrounded by a faithful company of valiant pupils, who have been and are diffusing in all parts of Italy the light of his knowledge.

A member of all the scientific societies of his specialty in Europe and America, he was also a member of the Lancesian Academy in Rome, of the Italian Surgical Society, of the Royal Medical Society of Rome; and was recently made an honorary member of the Royal Society of Medicine and Surgery of London. He was also active at the National and Inter-

national Congresses, to which he brought the contribution of his knowledge, his wisdom and his experience.

During the Italo-Turkish War he was in Libia as Inspector in the Red Cross. He again donned his gray-green uniform in the Italian-Austrian War, giving his service for the comfort of the sick and wounded.

Numerous national and foreign honors conferred upon him were merely testimonials of his exceptional merit.

His day's work was ended after he had done so much for Science, Humanity and his Fatherland.

Abstracts of Current Articles

The first number of "Otolaryngologica Slavica," edited by Professor Kutvirt and published in Prague, is an excellent indication of the zeal with which Czech, Polish, Bulgarian and Russian otolaryngologists have been prosecuting their studies during the past ten years. Articles will appear in French, English or German, with a short résumé in one of the other languages. The format, paper and illustrations are excellent, and the enterprise is fostered by the Ministry of Public Instruction of Czechoslovakia.

Among other articles are noted the following:

Simplification of Conservative Septum Operation (Vereinfachung der Methodik der Konservativen Operation an der Nasenscheidewand).

Prof. W. I. Wojatschek (Leningrad). Otolar. Slav. 1:10, 1928.

The author has developed the technic of retention of unthickened portions of the septal skeleton, chiseling off crests and doubled portions through submucous incision. Deflected portions which are not thickened he leaves attached to one or other mucosal layer, depending on the direction of the deviation. After mobilizing an anterior and a posterior disc in anteroposterior bends, or a superior and an inferior disc in vertical twists, he packs the septum straight with vaselin gauze strips inserted at the regions of greatest previous deformity, leaving the opposite side (formerly hollow) without packing.

F.

Hypotonic Degeneration of the Labyrinth in the Newborn.

Dr. A. Precechtel (Prague), Otolar. Slav. 1:21, 1928.

The author believes that faulty birth presentations and abnormal fetal postures may be caused by degeneration of the vestibular apparatus, either peripheral or central, and has demonstrated such pathologic changes in three of his five cases. The cochlea was also involved. In an earlier series, delayed sitting, standing and walking were observed. The author's English is somewhat awkward, but his study (under Kutvirt) is thorough and well documented and illustrated. F.

Scleroma from the Clinical and Anatomopathologic Standpoint. (Le Sclerome au point de vue Clinique et anatomo-pathologique.)

Prof. J. Szmurlo (Wilno), Otolar. Slav. 1:58, 1928.

Scleroma, formerly prevalent in White Russia, has, by reason of troop movements during the war, been transmitted to Belgium, France, Germany and elsewhere. Endemic in Poland, Czechoslovakia and Jugoslavia, it attacks persons from 5 to 50 years of age, mostly between 20 and 30, and in the lower walks of life. Seventy-five to 80 per cent of scleromatous lesions occur in the nose, as more or less diffuse thickenings of subcutaneous and submucous tissues about the nostrils, anterior part of the septum and floor of the nose. These infiltrations, red, dry, fetid and crusted, may close the nostrils completely, and may extend backward into the choanæ and immobilize the soft palate and epipharynx. Subglottic infiltration with more or less fixation of the cords is found in 10 per cent. This may invade the anterior commissure and cause serious dyspnea, as will also bulbous enlargement of the false cords. Diagnosis is based upon the characteristic nasal infiltration, freedom from fever, ulceration and pulmonary signs. It resembles syphilis, but gives a negative Wassermann and no visible scars; but syphilis and scleroma may coexist. It has not been found together with tuberculosis, and aside from dyspnea the patient's general condition is good.

Positive diagnosis depends upon bacteriologic (Frisch's diplobacillus) and histologic examination. Characteristic cartilaginous hardness is seen in fresh lesions; ulceration not at all. Microscopically, the initial stage of lymphocytic infiltration accompanied by large vacuolated cells of Mikulicz and plasma cells is followed by infiltration of hyalin substance. In old lesions much fibrous connective tissue replaces the hyalin infiltration.

The disease is thought to be incurable, though not dangerous to life unless dyspneic complications arise from its location. Progress is slow. Early cases may be helped by vaccines and the X-ray. Later, operation must be made; in the nose, excision with rubber tubes through to the pharynx; in the larynx, preliminary tracheotomy and removal of the growths by laryngofissure. Crusts may block the trachea during healing. Rigid quarantine and radical treatment are recommended. F.

Hypophyseal Syndrome After Puberity with Persistence of Adenoids. (Syndrome Hypophysaire chez la adénoïdiens après la puberté.)

Prof. S. Citell (Catania), O. R. L. Internat., 12:499, 1928.

Since 1911 the author has called attention to the frequency with which persistent adenoid accompanies infantilism, impaired sexual development and faulty carbohydrate metabolism. He recommends adenoid surgery followed by pituitary gland treatment in such cases, which are, in his opinion, almost as frequent as the nasal and aural complications found before puberty. F.

Pernicious Anemia—An Experimental and Clinical Investigation.

Davidson, Stanley, Edinburgh Medical Journal, 1929, 36, 2.

This is a complete article touching all phases of pernicious anemia, but deals particularly with the therapeutic side. One paragraph relative to the use of liver is pertinent and instructive.

He warns against the indiscriminate use of liver in the treatment of all manner of ailments, both by the laity and by the medical profession. It is emphasized that before prescribing liver therapy, it is most essential that an accurate diagnosis be made, for it is only in anemia of the pernicious type that satisfactory results can be regularly expected. Since the price of liver has risen greatly, its indiscriminate use has placed on the poorer classes an economic burden. Every week he is told by patients that they are unable to obtain it in sufficient and regular quantities, and he thinks a law should be passed whereby pernicious anemia patients should have first call on liver for sale in the butcher shops. M.

A Case of Sudden Death Due to the Occlusion of the Larynx by Two Ascaris Lumbricoides.

M. B. Duncan Dixey.

Child, aged eight and a half years, while carrying a bucket of water from a well, suddenly fell forward on her face unconscious. She died in less than three minutes. A postmortem was made. The body was that of a healthy, well nourished, female child. Froth was present in the nose and mouth. All thoracic and abdominal viscera were congested. On removing the tongue and larynx, two large ascaris lumbricoides were found; they were curled and the two had occluded the larynx

and completely blocked respiration. One more worm was found in the stomach and two in the small intestine.

It is conjectured that they ascended from the stomach and that the rapid and deep respiration from the exertion of carrying the water drew them into the larynx. M.

Peptic Ulcer of the Esophagus.

Friedenwold, Julius; Feldman, Maurice; Tinn, Waitman, Am. J. Med. Sci., 1927, 177:1-14.

The above authors state that peptic ulcer of the esophagus, though rare, occurs sufficiently often to be of clinical interest and closely resembles a similar affection of the stomach and duodenum.

They occur most frequently in the lower third of the esophagus and usually on the right posterolateral wall. All other forms of ulcerations in the esophagus must be excluded before a diagnosis of peptic ulcer is made. The ulcers may be very superficial or extremely deep; in the latter type the blood vessels may be eroded, perforation may take place or adhesions to neighboring organs may form. Healing usually occurs with the production of cicatrices. Following the healing of large ulcers stenosis may take place.

Pain beneath the sternum and radiating between the shoulder blades, dysphagia, vomiting, hemorrhage and perforation are all prominent symptoms.

Diagnosis is made by history, roentgen ray and esophagoscopy. Treatment is mainly dietetic, but the authors feel that focal infections play an important rôle in the etiology and that all foci should be eradicated. M.

Society Proceedings

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Meeting of November 5, 1928.

THE PRESIDENT, DR. EDWIN MCGINNIS, PRESIDING.

SYMPOSIUM.

"Routine Functional Tests of Hearing: The Audiometers."

HORACE NEWHART, M. D., University of Minnesota (by invitation).

ABSTRACT.

The development of the audiometer marks a new era in the progress of otology. Previous to its perfection we were handicapped by the lack of an accurate standardized method of testing and recording hearing acuity. This fact naturally retarded research, made uncertain the results of treatment and was responsible in a large measure for the small interest and poor attainment in the prevention of deafness and conservation of hearing on a large scale.

The otologist must acknowledge his large obligation to the physicist, especially to the telephone engineer, who in his need for an accurate, scientific and practical method for obtaining fundamental knowledge regarding the capacity and requirements of the ear in long distance telephone transmission, devised the audiometer as we now know it. Special mention in this connection should be made of the work of Dr. Harvey Fletcher and associates of the Bell Telephone and of Dr. E. P. Fowler. This invention in its various types, as made available by the Western Electric Company, has stimulated among otologists an interest in research. It has given to physicians, educators and social workers a renewed hope of being able to effectively attack the large problem of preventing unnecessary deafness. The stimulus for producing the audiometer for testing large groups

has come in part from the deafened themselves, as represented by their national organization, the American Federation of Organizations for the Hard of Hearing.

The audiometer specifically finds its greatest use along the following lines:

1. Research.—In otology there are many unsolved problems in research regarding the incidence of hearing loss, the causes of ear diseases and their relation to general systemic diseases. In these efforts the use, especially of the 1-A audiometer, with its wide ranges of pitch and intensity, promises worth-while results.

2. In the clinical field, in the hands of the otologists, the smaller instrument, known as the 2-A audiometer, though of lesser range than the 1-A, is proving of the greatest usefulness in making possible greater accuracy and uniformity in testing and recording hearing loss. It is a great saver of time, enables the otologist to follow the progress of his cases more thoroughly, and makes possible the keeping of standardized records for the purpose of clinical comparison. The use of the audiogram is a distinct advantage in many cases in prescribing mechanical or electric hearing aids.

3. In the educational world the audiometer is most useful in determining the proper classification of the hard of hearing child as regards his need for specialized instruction.

4. In the industrial field the audiometer is of great value in detecting hearing loss among employees in hazardous occupations, as in the operating department of railroads, where the safety of many depends upon the hearing acuity of those in responsible positions. In this connection there is a wide use for the audiometer in testing all recruits for the army and navy. Our life and accident insurance companies will soon appreciate the value of the audiometer in securing an accurate record of the acuity of hearing of all their larger risks.

During the developmental period of the 4-A audiometer, through the courtesy of Dr. Harvey Fletcher of the Bell Telephone Laboratories, an early model was placed at our disposal for research work in the Minneapolis public schools. The results were so eminently satisfactory that immediately upon the release of the standard model with forty telephone outlets, the

audiometer was adopted by the Board of Education of Minneapolis, the first city in America, we believe, in which this method was officially put into use. Our experience is based upon the examination of over 30,000 school children annually since September, 1926. The results fully justify the procedure and promise much as a health measure.

A partial tabulation of the tests thus far conducted shows an average of 8 per cent of all Minneapolis school children to have a hearing loss of six sensation units or more in one or both ears. Seasonal variations are definitely noted, there being a greater incidence of hearing loss in the latter half of the school year, the result of coincident or previous attacks of rhinitis and other upper respiratory tract infections. There is definitely a greater frequency of hearing loss among younger children than those of more advanced years, among those who have had pathology of the tonsils and adenoids, and among those in whose history there is definite evidence of defective hearing among the immediate relatives. Poor hygienic conditions in the home are also reflected by a greater frequency of hearing impairments. Two and seventy-five hundredths per cent of those with hearing impairment show history of discharging ears, whereas among those with no hearing loss, or a hearing loss of less than six sensation units, there was noted an incidence of running ears amounting to only three-tenths of 1 per cent of those examined.

Dr. Warwick of Fort Worth, Texas, has recently shown a decidedly greater incidence of hearing loss among the colored people than among the whites.

5. One of the most important fields for the audiometer is in the prevention of deafness and the conservation of hearing through its wide application in the testing of large groups of school children to detect slight degrees of hearing loss, the presence of which often indicates abnormal conditions which must be corrected to prevent more serious hearing impairment. This principle has found wide acceptance, with the result that during the past two years the periodic examination of the hearing of school children by the multiple phonograph audiometer, 4-A instrument, and the individual, 3-A instrument, has been officially adopted in more than fifty American cities.

It is not to be expected that the audiometer will supplant our older methods of functional testing of the hearing apparatus. Notwithstanding the development of a satisfactory bone conduction receiver for use with the 1-A and 2-A audiometers, the tuning forks will continue to be necessary for qualitative tests and for differential diagnosis. The greater accuracy of the audiometer for quantitative tests, especially in dealing with slight degrees of hearing impairment, and the advantage of greater speed, standardization and economy, make the audiometer a most valuable—in fact, an indispensable supplement to the armamentarium of the otologist. The findings of quantitative tests by the watch, whisper and tuning forks are convertible into terms of sensation units, the standard units of the audiometric system. When so converted the results of the various tests, when made under favorable conditions, correspond very closely.

So great has been the interest in the newer methods of testing the hearing aroused among the laity through widespread publicity, that there is danger that they already have outstripped the general practitioner in their interest in and knowledge of the possible application of the audiometer. They are expecting its use by the otologist and are demanding its employment in the testing of school children. There is danger that the medical man, if he is too conservative in his attitude toward the movement for deafness prevention, will be regarded as disinteretsed or not up to date. Our textbooks and teaching of the general practitioner need speedy modernization in the lines of deafness prevention and the conservation of hearing. The medical man should exercise a leadership wherever he can in the movement for better hearing, which is distinctly a health problem. If he fails to do so he may be misjudged, and leadership in these activities may fall into less worthy hands.

"The Tuning Forks and Other Tests."

ROBERT SONNENSCHEIN, M. D.

ABSTRACT.

The purpose of functional testing of hearing is to determine whether a defect is present, the degree of the impair-

ment and the location of the lesion—that is, whether the conduction apparatus, consisting of the external, the middle ear, eustachian tube, is involved, or whether there is trouble in the perception apparatus, which consists of the inner ear and auditory nerve. Before resorting to any of the detailed tests one can get a considerable idea regarding the state of the patient's hearing by the general attitude, his apparent lip reading, the placing of the hand to one ear, thus improving the collection of sound waves, and the varying loudness of the voice. When bone conduction is greatly increased, the patient's voice sounds loud to himself and he speaks very low; vice versa, when the bone conduction is diminished, the patient's voice sounds very low to himself and he therefore speaks very loud. The pocket watch, the acoumeter and the voice are used in making the tests. The watch and acoumeter produce noises and are not very dependable for accurate testing. The voice contains both noises and tones, and while it is not possible to standardize it definitely, if care is used it is most valuable for determining in a practical way the individual's hearing efficiency. One should endeavor to use the same intensity each time by employing the residual air, with the patient standing at the farther part of the room with no part of the body touching the wall, the opposite ear occluded with the moistened finger, and the eyes closed or averted from the speaker. The examiner should approach the patient from a distance, noting at which point both low and high pitched sounds are heard. The tuning forks are most valuable for testing, as they produce pure tones and can be had in pitches ranging from C-2 (16 double vibrations) up to C-5 (4,096 double vibrations). In striking the forks, it should be remembered that the lower the pitch of the forks the softer should be the object used for exciting them,

In normal individuals there is no lateralization of sound.

The principal tests are the Weber, Schwabach and Rinne. The Weber is used for determining whether lateralization is present, by placing the fork in the median line of the vertex. In middle ear or conduction apparatus impairment, lateralization is usually to the worse ear; with inner ear lesions it is usually to the better ear. There are many exceptions to this rule, and thus the Weber is the least reliable of the major

tuning fork tests. If, however, with the Weber lateralized to the worse side in a middle ear infection, there is suddenly a change in lateralization to the better hearing ear, it usually means an extension of the infection to the inner ear of the affected side, so that the Weber then gives most important information.

The Schwabach test determines the bone conduction in the individual compared with a normal living or an objective standard. A slight diminution or a slight increase in bone conduction is of no significance, but a markedly increased bone conduction usually means conduction apparatus involvement, and a decidedly shortened bone conduction usually indicates a perception apparatus involvement. Bone conduction, however, is affected by many factors, such as age, the thickness of the skull, adhesions of the dura to the bone, etc.

The Rinne test serves as a comparison of the air with the bone conduction in the same individual. In normal cases we have a positive Rinne, namely, air conduction is much longer than bone; whenever bone conduction is longer than air, it is called negative Rinne. After the tuning fork stem is no longer heard when applied to the region of the mastoid antrum the sound will still be heard by air conduction in the normal positive Rinne. When air conduction is longer than bone, but both factors are shorter than normal, we have a positive Rinne, but it means an inner ear lesion. There are also a number of varieties of the negative Rinne, depending upon whether the bone conduction is greatly lengthened or shortened. A negative Rinne usually means an impairment of the conduction apparatus, but when both air and bone conduction are much shorter than the normal, even though bone conduction is still longer than air, it usually means a combination of inner and middle ear disease. If with an "infinitely negative" Rinne there is no hearing by air, but slight hearing by bone, it usually means that the ear under examination is practically deaf and that the hearing by bone is by diagonal resonance and is really heard in the opposite or normal ear.

The upper and lower tone limits are very important factors. The lower tone limit is usually raised in diseases of the conduction apparatus, and a lowering of the upper tone limit is the first sign of an inner ear lesion. Later when the inner ear

is more involved, the hearing for all tones, high, medium and low, is diminished. The upper tone limit is placed at about 20,000 double vibrations and is tested either with whistles, such as the Edelmann-Galton or the Schaefer-Galton; or, better still, with the monochord. With the latter instrument it is possible to test the hearing for the highest tones, both by air and bone conduction. The audiometer is a very useful instrument in many ways, but with the type usually employed in office practice the lowest tones as well as the highest tones cannot be tested. While it is difficult if not impossible to test bone conduction with the audiometer this can be done easily with tuning forks.

The newest development is the manufacture of tuning forks of magnesium alloy, consisting of magnesium, 95.6 per cent, manganese 0.4 per cent and aluminum 4 per cent. These forks are being manufactured at Riverbank Laboratory at Geneva, Ill., by Mr. N. E. Eisenhour. The advantage of these forks lies in the fact that they are rustproof and have a specific gravity about one-third that of steel, making it very convenient to hold and manipulate them. When forks are not nickeled they tend to rust unless they are properly handled and oiled. If they are nickeled, they sooner or later peel, and the vibration of the loose pieces of metal causes adventitious sounds.

Tuning fork and other tests are adjuncts in the making of a diagnosis of hearing defects. A careful examination of the patient, including ears, nose, nasopharynx and pharynx, is extremely important. The correlation of all of the facts obtained by history, examination and functional testing of hearing gives one the diagnosis, permits the formulation of the prognosis and the outlining of treatment.

Rarely do nose operations have any effect upon the hearing. Obstructions on one or the other side of the nose have practically no effect upon the hearing. Interference with proper aeration of the eustachian tube by marked hypertrophy of the posterior end of the inferior turbinates or the presence of adenoids in the nasopharynx may have a decided effect on the eustachian tube and produce impairment of hearing of the conduction type. Likewise, infections of the nasal accessory sinuses with drainage of pus into the nasopharynx may also

lead to involvement of the middle ear mechanism. The removal of septal spurs, deviation, etc., is of no value so far as the relief of hearing defects is concerned.

DISCUSSION.

DR. GEORGE E. SHAMBAUGH expressed the view that the functional tests of hearing which are of assistance to the practicing otologist are relatively simple and few. What exactly are the points about which the clinician wishes to have information? First, he wants to know whether there exists a defect in hearing. Patients may present themselves with the symptom of tinnitus aurium but with the belief that they have no loss in the hearing function. To ascertain whether there is a defect in hearing the whispered voice is usually quite satisfactory. We may add to this the test with the tuning forks for the lower tone range and with the Galton whistle for the upper tone range. It is sometimes desirable to know the exact measure of the loss of hearing. This is not of very great moment, as a rule, but it may be desirable to have as accurate a record as possible of the status of the patient's hearing for comparison in determining whether the condition is progressing, and also at certain times to ascertain whether treatment that is instituted is relieving the defect. This measurement of the acuity of hearing can hardly be carried out successfully with tuning forks. It can be ascertained with considerable accuracy by the use of the whispered voice, more accurately perhaps than one might suspect even in the noisy downtown district by observing the simple rule of having a patient always stand in the same place in the same room with the street window closed. The examiner acquires considerable skill in pitching his voice the same in making these tests. However, it would seem that the audiometer should be a more satisfactory means for making an acurate estimation of the exact status of the hearing. This presupposes that acoustic properties of the room in which the tests are being made are practically the same from day to day. A soundproof room is not needed for this purpose, because one is not trying to find out whether the patient has normal hearing. Dr. Shambaugh made a series of tests some time ago of an associate in his office who has normal hearing, making an audiogram every day for a couple

of weeks, and found the variation so slight from day to day as to be quite negligible.

Another fact which the otologist desires to ascertain from functional tests is an estimation of the handicap which a patient suffers because of an injury to the hearing in medical-legal cases. The handicap is expressed in terms of deafness for the voice, and the audiometer cannot give an estimation of the percentage of hearing loss that is of any practical assistance in determining this handicap. Still another problem which the practicing otologist wishes to determine is whether the patient has suffered a complete loss of hearing in one ear with the hearing in the other ear still intact. This has become a more important consideration in recent years because of its bearing on the clinical problem associated with labyrinthitis secondary to an otitis media. It is no simple problem to determine by functional tests whether there is any remnant of hearing in one ear with the other ear still hearing. However, an experienced otologist has often no difficulty in satisfying himself that there is a total loss of hearing, particularly in injury cases. Fractures at the base of the skull which wipe out the function of the vestibular mechanism are expected to destroy the hearing function as completely. Without a history of accident of this sort, the problem of determining unilateral total deafness is clinically a difficult one.

Bezold with his series of tuning forks and whistles for testing the entire range undertook to make a diagnosis of total deafness by testing a patient where he was certain that one labyrinth was destroyed and took this as a chart for comparing the results of an examination in a patient suspected of having total monaural deafness. This is more or less the method of procedure which has been usually employed for establishing the diagnosis of total monaural deafness. It occurred to Dr. Shambaugh that the audiometer would be a much more suitable device than the more cumbersome Bezold series of forks with their lack of accurate measurements, and a couple of years ago he published a series of audiograms of patients who suffered from total monaural deafness. The method, however, is not as useful as the ordinary methods for determining this fact. Dr. Shambaugh called attention to the fact that for practical purposes it is desirable to find out whether there is

a defect in either end of the tone range. A defect at the upper end of the tone range is ascertained with surprising accuracy by using the whispered voice, utilizing such numbers as 66 and 67. A defect can be ascertained in this way that can hardly be found with the Galton whistle. The monochord appears to be of considerable use in testing the upper tone range, and Dr. Shambaugh has found the audiometer of some assistance. It is different in the matter of testing defects in the lower tone range. Such defects can usually be picked up rather quickly by the whispered voice, but here the tuning forks are of particular value because the sound is not heard in the opposite ear and the tests can all be made by air conduction. The audiometer is not very satisfactory for testing the lower tone range, because a defect in the lower tone range is usually associated with increased bone conduction, and in using a telephone receiver for testing with the audiometer bone conduction is a factor, as is evidenced by the fact that a person suffering from obstructive deafness always hears the phone with remarkable clearness. A person with a less degree of deafness due to internal ear trouble, where bone conduction is diminished, experiences great difficulty in hearing over the telephone.

The important clinical problem for the otologist is that of determining where the alteration is located which is producing the defect in hearing—that is, whether the defect is one of obstruction to sound conduction or whether it is due to a defect in sound perception. To make this diagnosis, hearing tests are made which include bone conduction as well as air conduction. The bone conduction tests are the Weber, Schwabach and the Rinne. Dr. Shambaugh pointed out a few of the outstanding shortcomings of each one of these tests. The Weber is logically the ideal test in monaural deafness. It should be lateralized to the better hearing ear in nerve deafness, for obvious reasons, and for less easily understood reasons to the poorer hearing ear in conduction deafness. Most patients with monaural deafness have no definite lateralization for the tuning fork. The Schwabach test has very definite limitations. When one ear alone is affected the Schwabach gives a clue as to its cause only where the deafness is due to obstruction, because then one may get prolonged bone conduction. Where the one ear is involved in a nerve lesion with the other ear normal

Schwabach gives no assistance because the bone conduction is unimpaired. The Rinne also has very definite limitations. In unilateral deafness, where the defect is at all marked, the Rinne is negative, irrespective of where the lesion is located. Dr. Shambaugh has never been satisfied that he could make a diagnosis of a type of obstruction deafness by the Rinne test as indicated in Dr. Sonnenschein's remarks. Incipient fixation of the stapes will give first a short end positive, then plus and minus, then a slight negative, and finally, as the condition progresses, profound negative or absolute negative Rinne. Exactly these same reactions will be produced by alterations in the tympanum. What is diagnosed is the fact that there is obstructive deafness and something about the degree of the obstruction but nothing specific regarding the type of condition causing obstruction. The audiometer offers the best means for testing the acuity of hearing in the midst of the tone range, for in addition to the elevation of the lower tone range diseases of the internal ear are prone to produce defects in the midst of the tone range. Bezold pointed this out in connection with otosclerosis and referred to them as gaps, believing that there was no hearing in these gaps. These he detected by means of his tone series forks and whistles. By the Western Electric Audiometer it can be easily demonstrated that these are not actual gaps but depressions in the hearing.

Dr. Shambaugh pointed out that the audiometer supplies an interesting adjunct to the functional tests which the clinician requires, but that it is not a very important adjunct and in no sense supplants the other functional tests. Its chief value is as a research instrument, and for those who are interested in the problem of sound perception independent of any practical assistance one gets from making tests. An audiometer is a useful instrument in an institution where otology is being taught. It helps the students to visualize facts which are not easy for them to grasp otherwise.

Dr. J. Holinger said that one must differentiate between two forms of hearing tests. The audiometer gives a functional test showing whether the hearing is normal, and, if subnormal, what the percentage of the loss is from the normal for the different pitches. Bezold's tests are diagnostic insofar as they help to locate the cause of the loss of hearing, either in the

middle ear or in the inner ear. Bezold measures the hearing by air conduction and hearing by bone conduction, and compares hearing by air conduction with hearing by bone conduction after having ascertained their relations in the normal ear. Rinne's test compares hearing by air conduction with hearing by bone conduction in the same ear. The Weber-Schwabach test compares hearing by bone conduction of one ear with that of the other ear and with that of the examiner, who previously has gauged his own bone conduction by comparing it with so and so many other normal individuals. This analysis or measurement puts one in a position to say whether the interference with hearing is located in the middle ear or in the inner ear, including the acoustic nerve and its central parts. Siebenmann showed by several hundred postmortem examinations that the conclusions which are drawn from such measurements are correct. The theory of how normal hearing by bone conduction occurs, and the theories of how the pathologic changes in the middle ear or in the inner ear affect the hearing by bone conduction Dr. Holinger considered irrelevant, but stressed the point that the technic of the measurements must be minutely followed if the result is to be of any value. A book by Professor Schittler on the fundamental tests of the ear he considered of great assistance in answering many questions and eliminating uncertainties.

He called attention to the statement of Bezold that the pitch of speech extends over the whole audible sound scale, from the lowest pitch to the highest. Therefore, speech, whispered as well as loud, is an adequate, convenient and inexpensive instrument for testing hearing. The range from b^{I} to g^{II} is important only for hearing tests of deafmutes, for if a deafmute hears the tuning forks from b^{I} to g^{II} 10 per cent of the normal length of time, this hearing may be used as adjuvant to teaching him to hear speech, together with lip reading.

As to nasal operations on patients suffering from otosclerosis, many of these unfortunates claim that each nasal infection makes them worse, and that they do not return to as favorable a condition after the infection clears up. If the tendency to recurrent colds can be eliminated by correcting the deviation of a septum, or a hypertrophic lower turbinal, something can be accomplished for these patients that is well worth while.

Dr. G. Henry Mundt, referring to the routine examination of railway men, said that the medical section of the American Railway Association has not been as keen as they should have been in determining the hearing ability of the men employed. One of the large systems estimated the hearing at 20/20 if the individual examined heard spoken voice at 20 feet. This should put medical men on the alert to discover defects in hearing, and it is possible to test out large groups by means of an audiometer. If defective hearing is considered an imporant factor in disqualifying men for driving motor cars it should certainly hold true also in railway work, and there is no other method that can be placed in the hands of a large group of examiners aside from the audiometer. All otologists should be interested in the audiometer in testing men in industry. Dr. Mundt believed it is certain to come into general use, and physicians should interest themselves in having the apparatus demonstrated to groups of physicians. The profession will have to get behind the examination of men who are going to operate motor cars, and if hearing defects have a tendency to disqualify a man for such a position some method should be determined which can be recommended for such examinations.

Dr. Joseph C. Beck said they had used the audiometer from the beginning, comparing those results with the results obtained from the tuning forks and other methods of testing hearing. He has not found it easy to get away from the older methods, and still insists that they be used as a check-up on all cases. He agreed with Dr. Mundt that the profession should get behind the test, for it is a source of great interest in the literature of this country and Europe. All the truth should be brought out regarding the test, but brought out in the right way. Not enough men have used the apparatus to permit one to talk of finalities in the audiometer test, and it is a useful adjunct to the hearing tests, especially when large numbers of individuals have to be examined.

Dr. A. A. Hayden asked Dr. Shambaugh how he diagnosed otosclerosis with the audiometer and how for comparison he diagnosed it with the tuning forks. Second, whether he thought an air cushion placed over the receiver on either instrument would lessen the question of bone conduction.

He thought the remarks of Dr. Mundt and Dr. Beck very timely, for the economic importance to the public as well as to the otologist and the deafened individual is of great concern. He did not see how hearing tests could become a part of routine periodic health examination unless some such device as the audiometer, both the 2-A and 4-A, could be used. If it is necessary to make a test of several hundred persons the 4-A audiometer offers the only logical method and is the only means by which the hearing of large groups can be examined. If defects in hearing are discovered those individuals can be subjected to more critical and painstaking tests.

He was glad to hear Dr. Shambaugh say that the human voice is a very accurate means of testing hearing acuity, and agreed with him that an observer can quite easily form the habit of carrying out the tests in the same way, making a standardized test, if working under the same conditions all of the time, but this meant nothing to the men who might have occasion to examine the patient in years to come. The audiometer offers a universal test for men everywhere, which the other tests do not. The economic factor is of importance and will largely determine whether or not the apparatus will be adopted. A set of all necessary sizes of tuning forks, a monochord and a whistle can be procured for several hundred dollars less than an audiometer, but the time consumed in making a complete tuning fork test is much greater than that necessary with the other apparatus. If the audiometer is used as an adjunct to the tuning fork tests the time consumed can be reduced considerably.

Dr. Shambaugh, in replying to Dr. Hayden, said that he appreciated very much the contribution of the audiometer by the Western Electric Company, and his remarks were in no sense disparaging to the use of this instrument. His effort was to point out where it might be of use to the practicing otologist. As for making a diagnosis of otosclerosis by the audiometer, this cannot be done. Even the diagnosis of obstructive deafness, as distinguished from perceptive deafness, cannot be made in many cases by the perusal of the audiogram. The finer points in diagnosis are dependent upon the tuning fork reactions.

Dr. Walter H. Theobald asked Dr. Newhart whether in the group examinations he differentiates between the right and left ear. He also defended the use of the human whispered voice and its value in helping to group cases at the time of first examination as to whether they are due to nerve deafness or sound conduction interference.

In the demonstration that was made of the audiometer he was interested in the fact that the record of the male voice made use of three numerals, 6—1—6, using two high tones and one low tone, and he wished to know if there was not chance for error in estimating the child's percentage of hearing since only high tones might be heard and not low tones, or vice versa.

Dr. Edwin McGinnis expressed his interest in Dr. Sonnenschein's remarks, and said that in patients with nasal obstruction he found that almost without exception the ear on the obstructed side was involved. He agreed that it was not the deflection of the septum that caused the hearing impairment, but believed the infection that nearly always accompanies it was probably accountable for the defect.

Dr. Horace Newhart, closing, thanked Mr. Barland and his associates of the Graybar Electric Company, who demonstrated the audiometers, and Dr. Shambaugh and the others for their very considerate discussion of his paper. The 3-A and 4-A audiometers as employed in public school work are not, like the 1-A and 2-A instruments, to be regarded as instruments of precision, but, because of their vastly greater accuracy and the ease and speed with which they can be used in testing large groups, they present a great advantage over the old methods. The whispered voice and tuning fork tests should, however, not be discarded, but the audiometer must be regarded as a most valuable addition to the armamentarium by which the profession can make further progress, particularly in the field of research, and the prevention of deafness. Improvements will doubtless be made that will still further enhance its usefulness.

In correction of deflected septa and in the clearing up of nasal infections and sinus infections by giving better ventilation and drainage, there is a large field for endonasal surgery when applied with intelligence and proper conservatism.

Replying to the question of Dr. Theobald, it was stated that in the experimental school tests comparison was made between the right and the left ear for a time, but it was found of no practical value. After attempting an early survey of about 1,000 children with the watch tick and whispered voice test, the old method was quickly abandoned because of the great amount of time consumed and the unsatisfactory results caused by the many disturbing factors, when, through the courtesy of the Western Electric Company, an early model of the 4-A audiometer was placed at their disposal. The advantage of the audiometer in the great saving of time and the greater delicacy and accuracy of the test was strikingly apparent. No attempt has been made in tabulating the records to distinguish between perception of the sibilant sounds and the other sounds of the voice.

Dr. Newhart stated that the phonographic test records have already been made in the French language and are soon to be produced in the German. At the First International Otolaryngological Congress in Copenhagen, where he presented a paper on the use of the audiometer in public school work and demonstrated the instruments, the interest and approval in this distinctly American method was most gratifying.

Dr. Sonnenschein, closing, said that the reason so many individuals hear better over the telephone than otherwise is because by bringing the receiver close to the ear the intensity of the sound is greatly increased. Infection in the nose may affect the eustachian tube and have some effect on the hearing in that way.

With reference to using the audiometer in testing railroad and other employees and for testing groups in general, he stated that the necessary tuning forks could be procured much more cheaply, and the results obtained would be more accurate if the "constant" of decrement is used. The cost of the audiometer is a factor, and with the 2-A type one cannot test below 64 vibrations, but with the tuning forks this can be done, and the results are just as accurate. It is very nice to have the audiometers, but many things can be accomplished with the tuning forks and voice that cannot be done with the audiometers.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Meeting of Monday, December 3, 1928.

THE PRESIDENT, DR. EDWIN MCGINNIS, IN THE CHAIR.

New Vestibular Complexes for Localization of Brain Lesions.

DR. LEWIS FISHER, Philadelphia (by invitation).

(AUTHOR'S ABSTRACT.)

These were presented based upon an analysis of 139 verified brain lesions. The lesions were: 43 supratentorial, hemispheric tumors; 22 midcentral tumors; 37 cerebellar tumors, and 37 cerebellopontine angle tumors. An attempt was made to solve certain problems, such as:

1. Findings indicative of a brain lesion.
2. The value of vestibular tests in the determination of increased intracranial pressure.
3. Findings indicative of a supratentorial and subtentorial lesion.
4. Findings indicative of the laterality of the lesion.
5. Vestibular group findings diagnostic for each anatomic area.
6. Differential diagnostic signs between various anatomic areas.

Of the findings indicative of a brain lesion, spontaneous vertical nystagmus, poor pelvic girdle movements, marked disproportion between nystagmus and vertigo after turning, loss of responses from the vertical canals with good responses from the horizontal canal, perverted nystagmus from either the horizontal or vertical canals, and disassociated movement of the two eyes after stimulation, were among the most important findings.

It was found to be impossible to diagnose the presence of generalized increased intracranial pressure by means of the vestibular tests.

The presence or absence of symptoms of seasickness as a result of ear stimulation is most important in differentiating

between a supra- and sub-tentorial lesion. Cases of subtentorial lesions are never disturbed by the tests.

Tables were presented then showing the grouping of the findings in lesions located in the various anatomic areas. One very important table was for lesions located at the junction of the temporo-parieto-occipital lobe. This new complex is particularly important because the findings largely simulate those seen in cases of cerebellopontine angle lesions, and they are as follows: 1. Susceptibility to stimulation absent. 2. Past pointing uniformly good. 3. Spontaneous nystagmus absent. 4. Pelvic girdle movements good. 5. Nystagmus after turning, normal. 6. Vertigo normal or slightly subnormal. 7. Vertical semicircular canals impaired. 8. Perversion of horizontal canals, responses absent. 9. All vestibular fibers (vertical and horizontal canals) on the side opposite the lesion show impairment or absence of function, with hearing on that side normal. As the lesion is located more posteriorly and becomes more definitely occipital, this characteristic becomes less evident in proportion.

The following conclusions were made:

1. A brain lesion usually shows abnormal vestibular test findings.

2. Generalized increased intracranial pressure, as such, cannot be diagnosed by the vestibular tests.

3. The vestibular findings indicative of the laterality of a lesion are definite and reliable, when present, but not all brain lesions exhibit these signs.

4. The vestibular tests can usually differentiate definitely between a supra- and sub-tentorial lesion.

5. Each anatomic area presents vestibular group findings of its own.

6. While in the vast majority of cases the diagnosis of brain tumors can be made by the vestibular tests, their value would be greatest when taken in conjunction with the general clinical findings.

DISCUSSION.

DR. LEWIS J. POLLOCK, by invitation, expressed his appreciation of Dr. Fisher's brilliant exposition of an analysis of a large group of brain tumors, for only by such studies will the

profession be able to obtain signs permitting the localization of brain tumors through vestibular tests. Many features militate against the utility of vestibular tests, as well as of other tests in neurology. First, clinical phenomena observed rather constantly in certain lesions have led to the postulation of certain pathways which the anatomist is unable to find. Second, the several interpretations of possible dysfunction which arises from disease, which may be elicited through certain methods of examination of reflexes and other things along with stimulation of the labyrinth. For example, in nystagmus one may assume that the slow and the rapid components of nystagmus are due to stimulation of different parts of the organism, each of which may be separated by disease from the other. Or, one may conclude that the rapid and slow components are a part of the same process or diphasic reflex, just as is a scratch reflex in a spinal animal, which is released under certain conditions by the transection of certain pathways.

A third factor which militates against accuracy of localization is that if one is dealing with an experimental lesion of the brain or of the brain stem which could then be verified, it would be a simple matter to collect the several responses which occur from that lesion and to identify each group with a particular locus of injury to the central or peripheral nervous system, but, unfortunately, in disease this is impossible. It is known that supratentorial lesions are commonly followed by marked herniation through the incisura and as a result brain stem lesions must occur. It is known that some confusion may result from the pressure exerted upon the cerebrospinal tract against the edge of the incisura. The same confusion results from the production of a lesion on the opposite side of the midbrain. So only through the collection of a large number of cases and the careful description of their signs and symptoms may one say with some degree of reliability that wherever they occur these are the signs and these are the symptoms which most frequently occur as the result of lesions of certain parts of the central or peripheral nervous system.

Dr. Fisher's description of the pelvic girdle symptoms was particularly interesting to Dr. Pollock, and he was not surprised to know that a large percentage of such lesions was found in the motor cortex. The position of the body in rela-

tion to other parts of it is a reflex action. It is known that if one changes the position of the body of an animal in relation to the head, the position of the head will be righted, and if one changes the position of the body of the animal in relation to another part, it will right itself. This is the "righting reflex," so beautifully described by Magnus and de Kleijn. Strangely enough, these reflexes all disappear when the brain is transected below the midbrain, so it would be logical to assume that such lesions as interrupt the pathway to the midbrain will markedly interfere with the righting reflex. If the lesion is in the sensory or motor arc one would expect interference in that reflex; if in the motor arc one would expect that reflex to be absent. In labyrinthine lesions alone one would not expect this, because the sensory arc of the reflex is not limited to the vestibular pathways, and many of these reflexes travel through the proprioceptive pathways, and the righting reflex may still exist, because of body reflexes acting on the body, but if there is a lesion which would destroy as well the nuclei gracilis and cuneatus, there would probably be complete absence of all the righting reflexes.

It was particularly gratifying to have Dr. Fisher say that although he was concerned purely from the otologic standpoint, with the vestibular tests, that further neurologic examination would make the diagnosis much better, which is true. Dr. Pollock pointed out that in the occipitoparietal lesions the findings of a visual field defect itself would suffice to give a clue which would differentiate the occipitoparietal lesions from the sub- or infra-tentorial one.

He was in full accord with the importance of the labyrinthine examinations, but believed that they require a considerable amount of critical study and the development of an accurate technic of examination, the ability of close analysis and, finally, a great deal of pathologic and physiologic research to make them more valuable than they are.

Dr. George E. Shambaugh said that these tests of the vestibular mechanism made it possible to recognize even quite early lesions of the cerebellar pontine angle, and he was prepared to find that brain tumors in other locations might be recognized. These examinations are not the easiest to make and the findings are more or less difficult to evaluate. It is

only by carrying out the tests repeatedly and with scrupulous care that one is able to draw any definite conclusions. He appreciated Dr. Fisher's work and his valuable and lucid explanation.

Dr. George W. Hall expressed his interest in Dr. Fisher's work, and recalled his own report on one case of occlusion of the posterior cerebellar artery, in which he made the diagnosis on the otologic findings.

He felt in regard to Dr. Fisher's paper as he did in regard to neurologic surgery. Operations on the Gasserian ganglion are very simple, but in the hands of an individual not acquainted with the technic they become very dangerous. Dr. Fisher's work may be blazing a trail for something Dr. Hall believed would be of great value; at present the work must necessarily be more or less confirmatory, and the danger of relying on such tests entirely could only be brought out by experience. Not infrequently tumors in the frontal lobe may be diagnosed clinically as tumors of the cerebellopontine angle or as cerebellar tumors. Other methods must be used to verify or exclude the possibility of the growths being situated in the cerebellopontine angle. Also, there is difficulty in determining what lesions of the cerebellopontine angle are tumors. In many instances multiple sclerosis has been diagnosed as tumor of the cerebellopontine angle, and he was not willing to admit that one could state definitely by Dr. Fisher's methods that a lesion of the cerebellopontine angle was a tumor, because the findings may be due to lesions other than tumor. The clinical findings are all important, and if well trained men could take the time to study such cases as Dr. Fisher had demonstrated undoubtedly something could be brought out of the present chaos, but in attempting to cover too much territory such tests may mislead the neurologist or the neurosurgeon in making an incorrect diagnosis if too much credence is placed in them.

Dr. Robert Sonnenschein expressed his gratitude to Dr. Fisher for the information he had given him in his private office and clinic, as well as in his demonstration in Chicago. He stressed the great amount of care that Dr. Fisher used to make his findings accurate, and agreed that unless this was done in every type of test the findings could not be compared. Dr. Fisher, when working in his own surroundings, always

performs the tests in a very definite manner, but aside from the simple otologic signs and symptoms Dr. Sonnenschein felt that the neurologic findings were necessary, for only by the correlation of these with the vestibular tests could one hope to make a definite diagnosis in most cases.

DR. SAMUEL SALINGER called attention to the stress which Dr. Fisher laid on the absence of postrotatory vertigo in the subtentorial lesions, and asked what influence he would assign to active syphilis in a case he was examining. Dr. Salinger had recently seen a survey of some 400 cases that were examined with the idea of determining what influence syphilis had on these phenomena, and it was found that in a great majority of the cases postrotatory vertigo was absent. He asked if in his series of cases Dr. Fisher came across cases of active syphilis, how much value he would assign to this symptom.

DR. LEWIS FISHER, in closing, expressed his appreciation of Dr. Pollock's discussion, and agreed with everything he said but thought well to make one point clearer. He had not tried to trace out pathways. It is true that many of the pathways constituting the vestibular mechanism are not known. He had no doubt that some day someone would find a way to demonstrate them. Whether the present conception is correct or not is of considerable importance, but does not matter so much from the clinical standpoint. It is known what every individual will do in response to stimulation, for during the war these tests were performed and findings recorded in 50,000 to 60,000 persons. In disease some of the responses are either diminished, absent or perverted in some way. In this study they selected 139 verified cases out of many more that were examined, and the results he had described represented the experience with the tests in those cases. He did not know why the vertical canals on the opposite side do not function in a cerebellopontine angle lesion, but in the study of a large number of cases it was found that they did not. He did not know why patients with supratentorial lesions could be made seasick, nor why those with subtentorial lesions could not be made seasick, but this phenomenon had been proved in many instances. The fact that the reason was not understood he felt did not take away from the value of the tests.

Dr. Fisher emphasized the fact that while this work is of value in the localization of brain tumors, it is of much more value to the otologists in their own field of work. Close cooperation between the otologist and neurologist will be mutually advantageous. There remains much to be learned, but otologic study has contributed greatly to brain tumor diagnosis in general.

Answering Dr. Salinger's question, Dr. Fisher said he had no experience as to what syphilis as such would do to the vestibular mechanism, but if it followed the same course in the ear that it did in other parts of the body it would interfere with nystagmus and also with vertigo. There would be evidence of peripheral involvement, but nothing to label it syphilis or anything else. If gumma formed there would be evidence of a mass lesion, and if it caused destruction the tissue would give evidence of the destruction without "mass lesion" findings. He knew of no examination of this type that would differentiate syphilis from anything else.

He pointed out that one should not attempt to diagnose the type of lesion present, but only the fact that a lesion exists, although frequently one can say that it is a mass lesion, without being able to determine whether it is a growth or a cyst.

Several illustrative cases were cited.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Meeting of January 9, 1929,

Held in conjunction with the Middle Section of the American Laryngological, Rhinological and Otological Society.

DR. ROBERT SONNENSCHEIN, CHAIRMAN, PRESIDING.

CHAIRMAN'S ADDRESS.

Some Very Accurate Measurements of the Amplitude of Vibration of Tuning Fork Prongs.*

(ABSTRACT.)

DR. ROBERT SONNENSCHEIN: In order to have accurate methods in all functional testing of hearing, it is necessary that instruments which one uses, such as tuning forks, etc., be properly calibrated and that a definite technic be employed in order to get uniform and comparable findings. In the work done with the Webster phonometer some years ago it was found that apparently the greatest intensity of vibration emanated from the broad or outer surface of the prongs, a little less so from the narrower surfaces, still less from the ends, and least of all from the edges or angles formed by the broad and narrow surfaces. Some forks have prongs which show a quadrilateral cross section so that one cannot say a broad or outer surface if the outer surface and the anterior surface are of the same width. At the time that the tests were made, we did not realize that the shape of the prongs (that is, whether quadrilateral or oblong), the distance between the prongs, or its relation to the width of the prongs made any particular difference regarding the relative intensity of one or the other side of the prongs. It was not until Mr. Eisenhour of the Riverbank Laboratory called my attention to the possibility that these factors might have some influence that I decided to check the results I had obtained in 1924, in order to definitely settle the question, and

*This article appeared in full in the ANNALS OF OTOLOGY, RHINOLOGY AND LARYNGOLOGY, Vol. XXXVIII, No. 1, page 197, March, 1929.

also to modify my statement, if necessary, in order that the full truth might be known.

In order to test these points, Mr. Eisenhour and Mr. Tyzzer very kindly instituted some experiments at the Riverbank Laboratory in which I was privileged to participate. In order to definitely measure the amplitudes of vibration, the latter were observed through a microscopic eyepiece, in which there was a scale upon which the amplitude or excursion of the prongs could be definitely seen. The forks were activated electrically, and the intensity of sound was measured with the sound meter of Mr. Eisenhour. Thus an absolutely accurate picture of the intensity of the sound was obtained, and the amplitude of the vibration of the prongs measured. We then used the two very excellent forks that I had employed in my tests with the phonometer and compared the results obtained with them, with those belonging to the laboratory. In this manner it was seen that the forks which I had employed showed slightly more intensity from the outer surface of the prong than from the narrow surfaces, thus confirming my original findings; but with the Riverbank fork (whose shape and the distance between whose prongs were somewhat different from my forks), the reverse of this action was found. In other words, the shape of a fork and the distance between the prongs have considerable influence in determining which surface of the prongs emits the greater intensity of sound. The longer the distance between the prongs, the more sound can escape. In view of the fact that there is only a slight difference in the sound from the outer surface of the prong and that obtained from the narrow surfaces held parallel with the ear, I wish to repeat what I stated in my original paper—that even though in most forks that I have used the outer surface gives slightly more intensity than the narrower one, from a practical standpoint it will make essentially no difference which of these surfaces is presented to the ear, provided that the examiner always uses the same method in all his cases, so that he obtains uniform and comparable results.

With the phonometer inaccurately tuned, the outer surface of the prongs gives greater force; but with the hearing tube, etc., the two sides of the prongs seem to give the greater

pressure. The tables of figures arrived at in the tests are not included but only the conclusions reached from them.

(No discussion.)

DR. W. E. GROVE, Milwaukee, Wis., read a paper on

"Primary Cholesteatoma of the Temporal Bone."

(CASE REPORT.)

F. H., aged 18, was admitted to the Mt. Sinai Hospital on April 23, 1927, from the dispensary where she had been seen by Dr. Wolters with a fluctuating swelling in the upper portion of the right mastoid area.

Past history: The patient positively stated that the right ear had never discharged, as far as she or her parents knew, although the left ear had discharged off and on for several years. This left ear had been dry for the last nine months.

Present illness: Dr. Wolter's dispensary note states: "There is no discharge in the right external canal. The membrana tensa is white, rather thin and somewhat retracted. No perforations. The membrana flaccida is rather irregular but is not congested and shows no perforations." At this time there was a fluctuating mass about 2 cm. behind the upper attachment of the right auricle, which was opened by the house officer with the discharge of a thin brown secretion. There appeared to be a perforation of the bone beneath the incision and the patient was referred to the X-ray department. The X-ray showed the right mastoid area completely destroyed with an obliteration of all intercellular bone septa, while the left mastoid was of normal appearance.

My examination at this time showed both tympanic membranes of normal appearance, though slightly retracted. No perforations were seen in either drum. All the landmarks of the drum were of normal appearance. There was no congestion or swelling of either drum. The hearing was roughly tested in the patient's room and a very quiet pocket watch was heard at eight inches with each ear, while a whisper was heard at more than fifteen feet with each ear. The Von Pirquet and Wassermann reactions were negative. The blood examination showed: R. B. C., 4,200,000; W. B. C., 9,400; hemoglobin, 75 per cent. The differential count showed polymorphonuclears

62 per cent, eosinophiles 1 per cent, small leukocytes 30 per cent, large leukocytes 4 per cent and transitionals 3 per cent. The urine showed a trace of albumin but was otherwise negative.

Operation, April 25, 1927: There was a draining fistula about 2 cm. back of the upper attachment of the right auricle where the previous incision had been made. The usual postauricular incision was made to the bone. In separating the fibers of the sternomastoid muscle from the tip with a sharp elevator, the tip was broken into. The cortex was extremely thin and soft over the entire mastoid area. When this was removed the entire mastoid cavity was found filled with cholesteatomatous masses. This process had laid bare the lateral sinus from above the knee to the jugular bulb and had so flattened it that its outlines could only be made out with difficulty. The bone over the cerebellar dura behind the sinus had been eroded over an area as large as half a dollar. A small cupola-like extension of this general cavity toward the mastoid antrum region was cleaned out. This was, however, found to be absolutely shut off from the middle ear cavity by a solid bone partition which would nowhere admit a probe. All the walls of this enormous cavity were as smooth as burnished metal. The wound was packed as in a simple mastoid and the middle ear was not entered.

The postoperative course was entirely uneventful, and the patient was dismissed from the hospital on May 5, 1927. The mastoid wound was completely healed in about six weeks, at which time an examination of the hearing with the audiometer revealed a symmetrical curve in both ears with some reduction of hearing in the lower tone range.

Pathologic examination: Most of the tissue consists of soft gray structureless tissue arranged in concentric layers. The remainder of the tissue is made up of bone fragments. Direct smear of the tissue failed to reveal cholesterin crystals. Microscopic: The sections of the soft material show only a structureless, rather crystalline material. The sections of bone fragments show an increase in density of the bone, with the bone cells small or widely separated. The periosteum is thickened. The surface is covered by a thin layer of epithelium, squamous

in type and this is covered by a thin layer of the same material as that removed from the cavity.

Diagnosis: Cholesteatoma of the mastoid.

DISCUSSION.

DR. GEORGE E. SHAMBAUGH, Chicago: Cholesteatoma occurring as a congenital growth in the bones of the skull has long been recognized, and it would seem highly probable that such formation would occasionally be located in the temporal bone. When located in this region it is probable that their existence would not be detected except under rather unusual conditions. One of these unusual conditions could be when the cholesteatomatous mass encroaches upon the middle ear spaces, antrum, for example, and where as the result of an otitis media an infection takes place. This congenital cholesteatoma can be differentiated clinically from a similar condition which develops as one of the complications in chronic suppurative otitis media, which is the only type which most of us ever have an opportunity of seeing. The type of cholesteatomatous invasion of the temporal bone, which occurs secondary to chronic suppurative otitis media requires certain physical conditions for its development. These are well known to otologists and consist of a flat surface for the epidermis of the canal to pass over in its invasion of the middle ear spaces. This flat surface is usually provided for by a marginal perforation, especially one located in the upper posterior segment, or it may be an erosion of the incisura tympanica. However, a marginal perforation is not always required to provide this surface for transition of the epidermis. Shrapnell's membrane pulled in and attached to the neck of the malleus produces a concavity in which exfoliation of epithelium takes place with eventual invasion of the attic. The malleolus attached to the promontory may also provide for this transition.

I have recognized but two cases where I believed that I encountered primary chloesteatoma of congenital formation. Both became recognized because of symptoms resulting from an infection secondary to an otitis media. In both cases the perforation occupied the anterior segment of the drum membrane, was not marginal in character, and was produced presumably by the ordinary route of infection. The cholesteatomatous

mass located in the antrum became infected and the condition of chronic suppurative otitis media persisted. Clinically we recognized in both of these cases the peculiar penetrating odor so characteristic of most cases of cholesteatoma when they become infected. In both cases the tympanum was free from any accumulation of material. One case I recall with especial vividness because it was seen only a few weeks ago. Coming down upon the cholesteatoma in operating upon the mastoid, we encountered a glistening membrane forming its outer covering. The bone was removed extensively without at any point injuring this membrane. The bone covering the lateral sinus had been eroded for a considerable extent, yet there was no sinus involvement.

My impression is that the primary cholesteatoma of the temporal bone is quite exceptional and does not have the same clinical significance as a cholesteatoma secondary to a suppurative otitis media except when it becomes infected from an otitis media, and then I suspect it becomes as dangerous as any cholesteatoma.

Dr. Joseph C. Beck, Chicago: Both the paper and Dr. Shambaugh's remarks are of great interest, but the histologic sections shown by Dr. Grove were a great disappointment to me in that they did not show what I hoped he would bring out. He did not deal with the histologic pathology, and stated that he turned the operation into a simple mastoid procedure. If Dr. Grove will look up the subject (Goerke) he will find that it has been shown on going into the subject of the matrix of the cholesteatoma, where the operation is spontaneously performed by the cholesteatoma, one finds the smooth matrix. There is usually no invasion of the epithelium into the bone, whereas in the usual type of cholesteatoma with chronic suppuration there is invasion of the bone by the epithelium, which explains why recurrence so frequently takes place. The matrix must be destroyed. I wish to know whether Dr. Grove destroyed it in his case, and if so how he handled the case afterwards.

Dr. H. I. Lillie, Rochester, Minn.: A few years ago I reported two cases of symptomless cholesteatomas. In the history of one case, I was able to elicit a previous suppuration, and in the other I was not.

The point Dr. Beck just brought out is interesting. Certain cases in this group may be discovered quite accidentally. Something may not look right in the canal, and the roentgenograms show the condition Dr. Grove described. One may not elicit a history of suppuration, although the patient may have forgotten incidents of his childhood. In one of my cases the cholesteatoma had destroyed the squamous portion and the dura was covered by the basement membrane. Just behind the labyrinth the dura was very thin and cerebrospinal fluid escaped through a defect. The postoperative care was difficult. The membranous meatus was left intact and the middle ear was treated after the method of Bárány. The posterior wound was handled separately. It was necessary to scarify the dura to cause granulations to fill the cavity. The final result was satisfactory.

Dr. William E. Grove, Milwaukee, Wis. (closing): With regard to the stench that occurs in cholesteatoma, I think that is due to the secondary infection. In Dr. Shambaugh's case the infection must have existed long enough for the suppurative material to wander into the cholesteatoma mass.

No mention was made in the pathologic report of any epithelial ingrowth into the bone.

I also curetted as carefully as I could over the exposed dura and sinus, and as thoroughly as I could over the bone. I think the reason it healed nicely was that in this case there was no evidence of invasion of the bone by the epithelium.

Dr. John J. Theobald, Chicago, Ill., read a paper on

"Conditions of Hearing Found in 27,978 Chicago Public School Children."

(ABSTRACT.)

In a recent survey of 27,978 school children, 2.9 per cent were found to be hard of hearing; 1.5 per cent were found to have tubotympanal catarrh. The survey shows that it is reasonable to expect that one-fourth of all of the children examined will, if not properly treated, show an irreparable loss of hearing before they are thirty-five years of age. Of the children with tubotympanic catarrh, 33 per cent had had the tonsils and adenoids removed, thus indicating that tonsils and adenoids are not the sole causative factors in the hardness of

hearing due to tubotympanic disease. It is assuredly the duty of the physician, after the tonsils and adenoids have been removed, to see that proper treatment is continued in order to establish the normal mobility of the ossicular chain. It was found that 2,859 children had chronic suppurative otitis media. Many severely affected children in this group had never had any form of treatment whatsoever. Three children were found to have otosclerosis; thirty-four had nerve deafness; 171 were handicapped by the presence of cerumen. Lip reading instruction was advised in forty-one cases. The report confirms the belief that an otologic survey of the entire school system is imperative.

DISCUSSION.

DR. H. NEWHART, Minneapolis, Minn.: We are greatly indebted to Dr. Theobald for his valuable contribution in making a survey of hearing conditions in such a large group of school children. He and Dr. Norval H. Pierce have rendered a distinctive service in demonstrating by laborious effort the need and possibilities of such surveys among school children.

Beginning the work in 1922, in the preaudiometer days, Dr. Theobald has consistently continued along the old lines, using the time honored whisper test with results as stated in his paper.

Since September, 1926, when Minneapolis went on record as the first city to officially adopt the audiometer for the periodic testing of the hearing of its school children, at least sixty other American cities and important educational institutions have put into practice the periodic testing of the hearing by means of the audiometer. This is surely adequate recognition and endorsement of the importance and efficiency of this routine procedure.

The advantage of the multiple telephone phonograph audiometer and of the 3-A instruments over the whisper test in greater delicacy, accuracy and in economy of time, labor and money are too obvious to require comment. By comparison in the study of large groups the audiometer discloses the existence of a significant hearing defect in from two to five times as many individuals as does the whisper test.

The movement to give to every school child the benefit of regular periodic hearing tests is of great interest to the educator and of outstanding significance to the physician, especially to the otolaryngologist. To the former it makes possible a better understanding of the educational requirements of the individual pupil, disclosing those who, because of an overlooked hearing defect, require special attention, thus helping to reduce retardation, a condition abhorrent alike to the teacher and the taxpayer.

To the otologist the movement represents the initial step in effectively helping in the solution of the problem of preventing unnecessary deafness. Through the early disclosure of those cases needing corrective treatment of conditions known in many cases to cause ultimately a handicapping deafness, it offers opportunity to redeem ourselves in the eyes of an increasingly exacting public.

The problem is preeminently a health problem. The initiation and guidance of activities along those lines should be undertaken and continued by the medical profession, lest leadership fall into the hands of others less competent to carry on the work.

The movement is in its very earliest stages of development. There remains much to be done by way of standardizing technic and procedure in the follow-up of those cases of potential deafness. As a whole, the problem presents a sufficient number of angles to challenge and invite the active interest and support of every otologist in whatever community he may live.

In Minneapolis we have found, in testing annually 30,000 pupils, that practically 8 per cent have a hearing loss of six sensation units or more in one or both ears on retesting, all who, in the preliminary test, showed such a loss. This result compares favorably with those from other cities after making allowances for different standards. In some communities the standard for differentiating between those who may be disregarded and those who should have an otologic examination is nine sensation units loss. This, we believe, in fairness to the child, is not sufficiently delicate.

We have employed the questionnaire originally suggested, by the addition of several more questions, so that it now reads as follows:

1. Did you ever have an earache or pain in your ear?.....
   Which ear?.....When?.....
2. Did you ever have a running ear?.....Which ear?.....
   When?.....
3. Does it run now?.....
4. Do you ever have noises in your ear, like buzzing, hissing or roaring?.....Which ear?.....When?.....
5. Have you ever had your tonsils or adenoids removed?.....
6. Is there any member of your family hard of hearing?.....
7. Have you ever had a mastoid operation?.....
8. Have you a cold in your head now?.....

A careful study of the clinical facts thus obtained, in spite of many unavoidable inaccuracies, will yield useful information. Naturally there are variations in our results due to seasonal changes, age, environmental conditions and many other factors. The wide range in the results obtained from different cities does not lessen the importance of making these tests of hearing acuity, but indicates the urgent need for the development of a standardized technic of application of these valuable methods of making hearing tests among large groups.

Dr. Harry W. Dale, Chicago Heights, Ill.: Dr. Newhart mentioned the recommendation that these children be taken to their family physician. With all due respect to the general practitioners, we must say that they take out the tonsils and tell the parents the child will be all right, but within a year the child has ear trouble again. Would it not be better to recommend that the children be sent to a special ear, nose and throat man for examination, who in turn can make such recommendations as needed to the family physician?

Dr. John J. Theobald, Chicago (closing): We expect to use a 4-A audiometer in our next school survey, and to carefully check the cases so that not too many will be sent to the specialists or general practitioners who may send many back to us as "normal," thus discrediting our work to some extent and displeasing the parents.

Dr. Dale brought up a delicate situation. Most of the children have a family physician, and we recomend in most instances that they be taken to him, relying upon him to refer the child to a specialist if possible. When dealing with the

poorer families this cannot always be done, so we have sent a great many of these patients directly to the special departments in the clinics.

Dr. French K. Hansel, St. Louis, read a paper on

"Trigeminal Disturbances of Otitic Origin."*

(ABSTRACT.)

In three cases of chronic mastoiditis, the characteristic features were the attacks of severe pain and paresthesia in the second and third divisions of the trigeminal nerve on the affected side. All of the patients were completely relieved of pain following the elimination of the mastoid disease. In one ininstance the pain syndrome came on only after local treatment had been instituted. There is every reason to believe that the pain in the trigeminal areas was of a reflex nature and that the stimulus originated in the middle ear and mastoid. Review of the literature shows that surprisingly few cases of a similar nature have been reported.

In the final analysis of the nerve supply of the middle ear and mastoid and adjacent cutaneous areas, it is apparent that intimate anastomoses exist between the various nerves considered, to such an extent that a nerve plexus is formed. Trigeminal disturbances are possible, therefore, through the geniculate ganglion of the facial and the petrous ganglion of the glossopharyngeal nerve.

DISCUSSION.

Dr. Samuel Salinger, Chicago: Dr. Hansel's paper is another valuable addition to the increasing literature on the subject of pain in relation to otologic pathology. We are becoming more and more aware of the value of careful study of referred pain as evidence of deep-seated disease in the auditory apparatus, and are beginning to understand something of the complicated mechanism by which these symptoms are produced.

When we consider the most intricate ramifications of the cranial sensory nerves, and the vast network through which they become interrelated, we are amazed at the possibilities that exist for the conduction of stimuli to distant parts, and

*This article appears in full in the preceding pages of this journal.

begin to appreciate the labors of pioneers like Sluder, Hunt, Larson, Fenton and many others, who tried to work out the histology of this subject. Now that clinical and pathologic data are at hand, it is possible to correlate the results of investigations along the different lines of attack, and soon it will be possible to draw definite diagnostic and prognostic conclusions for our future guidance.

With particular reference to trigeminal neuralgia arising from tympanic or mastoid pathology, so well illustrated in Dr. Hansel's cases, I should like to call attention to several other conditions which may produce the same symptoms, and in which the differential diagnosis cannot be made from the pain alone.

First, neuralgia associated with so-called "vacuum mastoiditis." Dr. Wieder's case, cited in Dr. Hansel's paper, is typical of this. Operation disclosed practically a normal mastoid, but the procedure resulted in relief from the pain. I have seen the same thing happen when no operation was performed.

Second, neuralgia associated with influenzal non-suppurative otitis media. This type generally results in spontaneous cure, although frequently running a protracted course.

Third, neuralgia the result of Gasserian ganglion involvement in Gradenigo's symptom complex. This frequently exists without abducens paresis, and may be the sole diagnostic sign of a deep-seated petrous bone involvement.

Time does not permit a full discussion of these and other possibilities. Suffice it to say that while the neuralgia may serve to direct attention to the auditory apparatus, it will in many cases require the utmost diagnostic skill and study to determine the character as well as the location of the pathology.

DR. WILLIAM E. GROVE, Milwaukee, Wis.: Did Dr. Hansel attempt to alleviate the pain in any case by cocainization of the sphenopalatine ganglion?

DR. JOSEPH C. BECK, Chicago: Did Dr. Hansel use trethylamin as an anesthetic or therapeutic measure?

I think the value of this preparation should be brought to the attention of the meeting. It is a remedy that is not applied,

but inhaled. It is a clear fluid, of which ten to fifteen drops are put on cotton and inhaled. If the pain ceases, the pain is probably due to neuralgia; if not, it is probably due to hysteria. We have used it in a good many cases with indifferent results and at some future date will be able to make a more complete report.

DR. FRED A. FIGI, Rochester, Minn.: In our section at the clinic we have used trethylene a number of times in cases of trifacial neuralgia but have never seen it give any relief.

DR. GORDON F. HARKNESS, Davenport, Iowa: What is the prognostic significance of trigeminal involvement in Bell's palsy?

DR. F. K. HANSEL, St. Louis (closing): I neglected to mention in my paper that cocainization was attempted but no relief was obtained. I did not use the preparation mentioned by Dr. Beck and have had no experience with such a condition as Dr. Harkness mentioned.

DR. ROY A. BARLOW, Madison, Wis., read a paper on

"Retropharyngeal Abscess."*

(ABSTRACT.)

Retropharyngeal abscess occurs frequently enough following respiratory infection in young children to warrant attention. In a small child, unilateral cervical swelling in the region of the sternocleidomastoid muscle associated with difficult breathing and swallowing, following an acute respiratory infection, should arouse suspicion of the possibility of the presence of a retropharyngeal abscess. Palpation is important in the diagnostic procedure. Surgical treatment is indicated for this condition.

DISCUSSION.

DR. H. I. LILLIE, Rochester, Minn.: Retropharyngeal abscess is encountered often enough so that the syndrome is readily recognized.

There are three points which I would emphasize: First, in the stage before suppuration, incision is not well directed.

*This article appeared in full in the ANNALS OF OTOLOGY, RHINOLOGY AND LARYNGOLOGY, Vol. XXXVIII, No. 1, page 205, March, 1929.

Second, if drainage is decided upon, incision into the mass is best accomplished by holding the knife parallel with the edge of the tongue, in contradistinction to an oblique direction from the opposite angle of the mouth. The reason for this precaution is obvious. Third, external drainage may be decided upon in those cases in which the abscess is due to Pott's disease of extension of a cervical phlegmon.

The relief of symptoms from adequate drainage is striking.

Dr. Samuel Iglauer, Cincinnati, Ohio: I would like to mention just a few points, the first being the question of pathology. I believe most retropharyngeal abscesses are caused by suppuration in the lymph glands, and adenitis, followed by a periadenitis. It has been shown by Most that there are lymph glands in the median line in infancy, but they are not found after the second year, and for that reason we do not often see retropharyngeal abscesses in children much over two or three years of age.

I think the use of a knife for incising an abscess of this type is bad, for one is likely to injure some of the vessels with a sharp instrument and, second, one is very apt to stick his finger. I think the best instrument is a pointed hemostat.

In palpating this region the mass usually has a very tense feeling, which always appeals to me as being like that of a tennis ball.

One point about the diagnosis is that the X-ray is of much assistance. If a lateral view is taken in a doubtful case, it will demonstrate in practically every case the presence of a mass in the retropharyngeal area, which a skilled roentgenologist and a laryngologist can often diagnose as an abscess.

Dr. George W. Boot, Chicago: A little girl about eight had a retropharyngeal abscess which was opened. Several hours later she died and the postmortem showed the cause of death to be diphtheria, although no false membrane was present. I do not approve opening a retropharyngeal abscess with a hemostat. A clean surgical cut is better than a ragged tear with a blunt instrument.

Dr. Hill Hastings, Los Angeles, Cal.: With regard to palpating with the finger, I had a case some years ago in which I was called to see a little baby because there was a question

of peritonsillar abscess. I had never seen one in an infant aged six months and doubted the diagnosis. I found the child in bed, with a swelling on one side of the neck, and the pediatrician said there was a swelling in the peritonsillar region. The breathing was slightly labored. I put in my finger to examine it and the child choked, coughed and got a little blue, but I was not greatly alarmed. I picked her up by the feet and thought the condition would clear up, but it became worse and I became really alarmed. I then took her to a window seat and started artificial respiration. By this time respiration had ceased. This was the only child of a young mother and an old father, so you can realize my alarm. The doctor thought he could get a feeble heart beat. I made a rapid incision into the trachea, took an artery forceps and spread it; respiration was established and the child came to life. I held the opened forceps until a tracheotomy tube could be brought from the hospital. Six hours afterward an abscess ruptured and a great deal of pus came out. Evidently it was a retropharyngeal abscess. The cause of the sudden and persistent cessation of respiration was likely a sudden increase in the laryngeal edema. The baby recovered.

This was a warning to me, not to palpate with the finger in such a case unless prepared to operate.

DR. EDWARD KING, Cincinnati, Ohio: This is an extremely important subject and, as Dr. Barlow said, the diagnosis is often overlooked. These children are usually brought to the hospital with a diagnosis of pneumonia, and the diagnosis of retropharyngeal abscess is not made until after the child has been in the hospital some time.

The position of the patient is important. When opening the abscess the head should be down, for there is a tremendous gush of pus. If the head is extended downward there is very little chance of the pus running into the trachea.

I think palpation is the most valuable aid to diagnosis, for these abscesses occur in very young children and we cannot see into the pharynx well.

As to X-ray diagnosis, I have a couple of slides which show very well what Dr. Iglauer spoke of in this connection, which I will pass to Dr. Barlow for his elucidation.

DR. HORACE R. LYONS, Chicago: The few cases of this type that I saw prior to this winter I did not consider of serious nature, but this season I have seen two fatal cases. This impresses me with the thought that retropharyngeal abscess is very serious. In one of these cases I did not arrive until after death had occurred, but the child I saw had a definite abscess, with so much swelling and edema of the entire pharyngeal structures, and the patient was so septic, that I thought the abscess should not be opened at the moment. Two other laryngologists were called in and they both advised immediate opening. This was done and the child promptly died.

DR. LOUIS OSTROM, Rock Island, Ill.: I wish to point out that any ordinary trocar run into the abscess will aspirate it well and practically obviate all the complications we run into otherwise. Forceps can be used to widen the opening. A dental suction apparatus attached to an ordinary dental cuspidor in the office can be used at any time one wishes, thus preventing the pus from running into the trachea.

DR. ROBERT SONNENSCHEIN, Chicago: I agree with Dr. Iglauer that it is much safer to use a blunt hemostat, and then quickly separate the jaws of the instrument as you invert the child's head. I have never found one of these abscesses that could not be opened in this way.

The important thing is the pathology. There are two types, that in which the abscess lies behind the mucosa and anterior to the scalene muscles, and presents in the pharynx, which is the usual form. The other type lies behind the scalene muscles, is apt to burrow down into the mediastinum, and causes death if not promptly treated. This form should be evacuated by external operation.

DR. ROY A. BARLOW, Madison, Wis. (closing): The X-ray findings in these cases are quite typical and very valuable, and oftentimes are the keynote of the diagnosis. The pharyngeal mucosa is pushed forward by the collection of pus behind it and this is easily demonstrated in the roentgenogram.

There are different kinds and types of instruments used by various men successfully, and I personally believe that one should use that instrument which is most comfortable and safe in his own hands.

DR. ARTHUR M. ALDEN, St. Louis, read a paper on

"Some Unusual Cases of Lateral Sinus Thrombosis."*

(ABSTRACT.)

Case 1 is typical of the hemorrhagic type of mastoiditis. The patient had from the first a severe fulminating type of mastoiditis but lack of profuse secretion and pressure within the middle ear, coupled with an involvement in the external canal, was the cause of a mistaken diagnosis. Although the symptoms referable to the middle ear all subsided, the disease process inside the skull continued, and it was only with the onset of symptoms which pointed to intracranial disease that the presence of a serious infection was recognized. Case 2 was also of the hemorrhagic type of mastoiditis with profound blood stream infection, even though two blood cultures were negative. Just why no secondary suppurative foci developed and why the large joints bore the brunt of the septic attack are debatable questions. Case 3 was one of sterile thrombosis of both lateral sinuses. Apparently the condition arose very slowly, allowing time for a compensatory collateral circulation to be established, probably by way of the inferior petrosals. Case 4 presented several unusual features, including the combination of an aseptic thrombus in the sinus with a malarial infection. Such a case has not been encountered before in the literature. This patient ran a very slow pulse, 60 to 70, throughout the course of the fever, and a definite nystagmus was observed on the day of the second mastoid operation. In all probability had the malarial infection been determined earlier and adequately treated, the presence of the thrombus in the lateral sinus would never have been suspected.

DISCUSSION.

DR. A. A. HAYDEN, Chicago: This paper is particularly instructive and a recitation of four cases with only one fatality represents a lower mortality than is ordinarily expected in any series of cases of lateral sinus thrombosis.

I wish to mention some of the things that seem to me to be of prime importance in handling any case of this type. The

*This article appears in full in the preceding pages of this journal.

remarks are prompted by the case of the patient who also had malaria. I wish to submit this proposition, with no criticism of Dr. Alden. None of us would have thought of having that patient examined for malarial plasmodia before the operation was performed, but does not the fact that this condition was found in the case emphasize the fact that a most searching physical examination is always advisable, not only in lateral sinus thrombosis but in mastoid cases, any of which may be complicated by a clot in the vein? I think the examination should include not only blood and spinal fluid Wassermann tests, but examination of the blood for malarial organisms. Perhaps the lateral sinus would not have been opened if the condition had been discovered before the operation. Perhaps the symptoms of lateral sinus thrombosis would not have appeared. The condition of the lungs, and anything that might explain the increased temperature should be most carefully investigated.

Something very important was presented at the Washington meeting of this Society on Monday, which I would like to call to your attention. That was the paper of Dr. Kolmer, in which he emphasized the fact that wherever the pneumococcus is found in the discharge from the ear or from the mastoid wound, if it be of the first, second or third type, great confidence may be placed in the administration of antipneumococcic vaccine. Dr. Kolmer expressed the belief that where this organism is found anywhere in the nose and throat, the patient may be benefited by the administration of optochin, 2 grains, every five hours. Six ounces of milk should be given immediately following its administration, so as to prevent the action of the hydrochloric acid on the optochin.

I think the most important thing in the treatment of lateral sinus thrombosis is its prevention. Early and careful mastoid operations, keeping particularly in mind the fact that the sinus wall should not be unduly traumatized, and if it is necessary to expose it that it be handled with the greatest care, will prevent many of these cases. The most significant symptom is the occurrence of a high temperature with chills and sweating, and if the curve goes below normal in the period between the chills this is of great importance as a danger signal.

Dr. William V. Mullin, Cleveland, Ohio: I recall the case of a man upon whom I did a radical mastoid operation because

of a chronic discharge and severe vertigo, and found the lateral sinus very superficial and very far forward. Dr. Beck at that time spoke of the occurrence of chills and other symptoms following mastoid operations and suggested making a stab wound below the tip of the mastoid and putting a drain in that way. This I did and closed the mastoid wound more than I would otherwise have done. In a few days the man presented the typical picture of a beginning sinus thrombosis. We immediately examined the blood and could not demonstrate the malarial parasite, but he had a history of having had malaria when he lived in Texas. I opened the wound and could see the wall of the sinus very clearly. It looked healthy and on that basis we administered quinin intravenously, which solved the situation satisfactorily. Even if the malarial organism is not found, the therapy may be useful.

Dr. H. I. Lillie, Rochester, Minn.: The recitation of these unusual cases of sinus sepsis in otitic disease is very important. The typical cases are easily recognized, but the atypical ones give much trouble. I believe the observations of Dr. Alden are very accurate. The patient who died may have had a case in which retrograde extension of the infection involved the cranial sinuses. If it were on the left side one might expect in 50 per cent of the cases to have the extension directly into the straight sinus. We have seen this happen in three cases.

The case in which the Tobey-Ayer test was made and gave a false positive result falls into that group of cases recently reported. The same observation has been made in our service.

We have seen chronic cases which gave a history of severe illness with chills, fever and headache at the time of the initial ear trouble, and subsequently recovered except for a chronic suppuration of the ear. In the instances in which radical mastoid operation was indicated, two of the patients were found to have collapsed sigmoid sinuses, probably the result of the preceding disease. These were not interfered with.

Dr. George W. Boot, Chicago: I wish to mention two cases—one in which I cut down and found the jugular vein full of pus which extended so far down that it was impossible to ligate below it. I incised and placed a drainage tube inside the vein. The patient recovered. The second was a Roumanian woman, aged 25, who had been having influenza. Every day

for a week she had a chill and a temperature of 104 to 104.5 degrees F. The left drum membrane was incised. The mastoid still being excessively tender, we operated three days later and at the knee of the sinus found a single cell containing pus under tension. This was opened and the temperature came down to normal for four days. On the fifth she again had a chill and the temperature rose almost to 106° F. The wound was reopened and irrigated, the temperature fell to normal and she recovered.

DR. ARTHUR M. ALDEN, St. Louis (closing): In the case in which the patient had malaria, the boy had never been out of St. Louis. There was one negative examination of the blood, but I feel that the persistent leukopenia, with chills and fever, should have made us more suspicious, and the second examination should have been made earlier. Had that been done I am sure the lateral sinus would never have been opened.

I am very grateful for the discussion.

DR. EDWARD KING, Cincinnati, Ohio, read a paper on

"Perforations of the Esophagus: Report of Six Cases."*

(ABSTRACT.)

Of the six cases presented four were produced by chicken bones, one was due to the passage of a metal bougie blindly for lye stricture, and the other was caused by swallowing a thumb tack. The youngest patient was six, the eldest fifty-eight years old. In two cases the perforation occurred in the thoracic area and in four in the cervical region. There was one death. Adults frequently swallow foreign bodies as the result of wearing false teeth, which deprives the individual of sensation in the teeth and soft palate, but none of these patients wore artificial dentures.

Pain is the first symptom which indicates the necessity for external surgery in these cases. Fever, rapid pulse and difficulty in swallowing rapidly ensue. Swelling of the tissues and emphysema are accompanying signs. The latter may be present in slight degree and remain unrecognized unless skiagrams are made. If, in addition to these signs, the leukocyte count is high, surgical treatment should be instituted. It is a rela-

*This article appears in full in the preceding pages of this journal.

tively simple matter in upper esophageal perforations to drain this area. It is not essential to remove the foreign body through the incision, but it is essential to provide drainage. If the foreign body is found outside the esophagus it can be removed, preferably by Marschik's method.

DISCUSSION.

DR. SAMUEL IGLAUER, Cincinnati, Ohio: Since I happened to be associated with Dr. King in most of these cases, my conclusions are much the same as his. The case histories of spontaneous perforation he cited from the literature I think would test the diagnostic ability of almost anyone, but in the one case in which the patient was supposed to have a ruptured gastric ulcer the ingestion of a barium meal might have assisted in the diagnosis. The careful roentgenologist, knowing the varied symptoms of gastric disorder, will study the esophagus as well as the stomach. Sharp foreign bodies are the ones that carry the greatest danger, as would be expected.

In cases of malignant disease it is always exceeding dangerous to attempt to get an instrument through the esophageal mass, for one may easily perforate the friable esophagus. It is unnecessary to pass the stricture, for if we see the cancer the diagnosis is confirmed.

The question in cases of perforation is when to call in the surgeon and when operation should be performed. Most of the cases terminate fatally without operative interference, but occasionally a patient recovers. It is better to perform an operation that may not be necesary than to miss the chance of doing one at the psychologic moment, as Marschik has pointed out. If the patient shows increasing temperature, dysphagia, pain, tenderness, swelling and emphysema it is time to operate.

Another point in the diagnosis is the presence of air in the retroesophageal connective tissue. This can be diagnosed by X-ray before it gets into the neck, and in some cases the emphysema never reaches the neck. Thus one can make a diagnosis of emphysema without palpating it.

It is not difficult to approach the esophagus through the neck, and anyone who can tie a jugular vein can, with a little practice, learn to expose the esophagus. The general surgeon does

not usually get our viewpoint, and when he is ready to operate it is often too late.

Another method of approach is by means of extrapleural mediastinotomy. The esophagus can be approached through the back by pushing the pleura aside. This is a difficult operation and requires a thoracic surgeon. Another method is that used by Seiffert, namely, internal esophagotomy performed through an esophagoscope. As I recall it, all three of his patients so operated recovered.

Dr. William V. Mullin, Cleveland, Ohio: Dr. King said that each case is an individual problem, and within the last ten days I have had one of these. A girl baby, aged about eleven months, was brought in about 11 p. m., after an automobile trip of seventy-five miles or so. She had been playing with her elder sister's hat that afternoon, and got an ornament that was on the hat into her mouth. The child was apparently quite comfortable, so I did not attempt to do anything until early the next morning, when a skiagram showed a foreign body that looked like a diamond shaped metal bar, with a straight pin sticking up from the top, at the mouth of the esophagus. It looked as if it would be an easy matter to get this, and I started to do it with a Jackson laryngeal speculum, but, much to my dismay, I could not find it. I even put my finger up in the nasopharynx, but could not find it. I did not put in an esophagoscope. Another skiagram showed that the foreign body had passed to the cardiac end of the stomach. The child was not in good condition, her temperature was 104° F., so I made no further examination. The child went through a mild attack of influenza, but nursed perfectly all the time and had no difficulty in swallowing. The foreign body was not in the trachea, and we checked it by the X-ray every second day and it did not move on into the stomach. A week later the child's temperature was normal, so I passed a 5 mm. esophagoscope, without an anesthetic, but could not find it, although there was not a great amount of edema at the lower end of the stomach. A skiagram at this time showed that it might have moved about one-fourth inch from its former location. On the following day the child was breathing badly, and a skiagram showed a complete spontaneous pneumothorax on the left side. She was apparently not very

uncomfortable and still took nourishment regularly and well. That afternoon she had embarrassed respiration. With the aid of the medical department a needle was inserted through the chest wall, the reading with a manometer taken, and air drawn off until the pressure was equalized, which afforded much relief. The following day a needle was inserted again and some fluid was withdrawn. Examination showed a pure culture of pneumococcus. The medical department reasoned that if the pneumothorax had resulted from a perforation of the esophagus there should be a mixed culture rather than the pure pneumococcus, and it was decided that this was the sequel of the mild influenza and not from the esophagus or my manipulation. There was no tear in the esophagus, and no blood was obtained. The child lived for seven days and died apparently from pneumonia. A postmortem examination was not permitted.

DR. EDWARD KING, Cincinnati, Ohio (closing): I have nothing to add, except to condole with Dr. Mullin in his interesting case.

DRS. SAMUEL J. PEARLMAN, MYRON E. KAHN and M. M. KUNDE, Chicago, Ill., presented a paper on

"The Histopathology of the Nose and Throat in Experimental Cretinism."*

(ABSTRACT.)

It seems desirable to study the histopathologic appearance of the tissues of the nose and throat in as many induced conditions as possible. These conditions will include those following extirpation of the thyroid, the testes and ovaries and possibly others, such as the pituitary. In this manner it is hoped that some light may possibly be thrown upon certain obscure diseases of the nose and throat, as yet but little understood.

In a small number of rabbits, a condition of marked cretinism was induced by the removal of both thyroid glands at an early age.

The skeletal and other changes produced were marked. Histopathologic examination, however, of the tissues of the

*This article appears in full in the preceding pages of this journal.

nose, tongue, larynx, trachea and esophagus revealed beyond a stunting of size of these various organs in the operated on animal, only an increased thickness and looseness in structure of the subepithelial connective tissue. There was no infiltration by abnormal cells, such as eosinophiles.

DISCUSSION.

DR. I. PILOT, Chicago: The results described by the authors are noteworthy in that, in spite of the profound disturbances in growth induced by the removal of the thyroid glands of young rabbits, there are practically no cellular changes in the tissues of the nose and throat. It would appear that the removal of the gland inhibited the normal growth of the tissues of the upper respiratory tract as well as of the entire animal. It would be interesting to know if the authors observed any disturbances of function such as excessive or diminished secretions of the structures involved. The microscopic appearances point against such derangement, but one might rightfully assume that some physiologic alterations might exist without histologic change. Such work as was reported constitutes fundamental studies of the nose and throat under conditions about which considerable speculation has been going on in the literature.

It has always appeared to me that the evidence was lacking for placing certain conditions on a basis of deficiencies of internal glandular secretions. For example, the assumption that the vasomotor rhinitis, either seasonal or nonseasonal, and the frequently associated asthma was due to deficiencies of thyroid secretion has no real foundation. Our experiences in these patients show no constant lowered metabolic rates. The microscopic studies of the authors reveal no changes such as we observe in the mucous membrane of the patient's nose. It is not our purpose to dispute the clinical results of the use of thyroid extract, calcium, and light therapy in hyperesthetic rhinitis, but we do take exception to considering this condition on a deficiency basis on evidence which is founded more on empirical measures rather than fundamental scientific studies. The improvement observed might very well be due to other influences such as those agents might have on the sympathetic nervous system, a theory which also needs investigation.

Quite often we note in the literature the possibility of the relationship of other glands of internal secretion to the obscure conditions of the nose and throat. It would be interesting to extend the reported experimental studies upon the influence of the removal of the parathyroids, the ovaries, or testes, upon the structures of the ear, nose and larynx.

Another problem that needs further investigation is the relationship of vitamin deficiencies to the tissues. Considerable microscopic study is necessary in order to clarify the conflicting views on this subject. Therapeutic studies, while very important, have been rather disappointing in conditions of vasomotor rhinitis and asthma. These diseases are so variable in intensity and subject often to spontaneous remissions that doubt exists when any agent appears to have some influence. Etiologic studies will contribute more, particularly further inquiries into the relationship of hypersensitiveness to these diseases. Bronchospasm is readily reduced in the guinea pig by acute anaphylactic shock; it would be interesting to know if repeated anaphylactic reactions or a more chronic state of anaphylaxis leads to changes such as are observed in vasomotor rhinitis.

It is well that the authors do not apply their results in the rabbit to the clinical condition of the human body. However, they might well extend their observations in man by making clinical and pathologic studies of the tissues of the nose and throat of patients who have had a thyroidectomy and who may subsequently develop symptoms of myxedema. I should like to inquire of the authors if they have studied the state of the nose and throat in such cases of postoperative or spontaneous myxedema.

Dr. Frank Novak, Chicago: I was greatly interested in this very careful piece of work. The experiment would be more valuable if an experimental animal could be found that could be observed over a long period of time. Then, instead of producing cretinism, a mild degree of hypothyroidism should be induced and maintained for several years. The mucosa of the nose and throat should then be studied to see what changes had occurred.

As Dr. Pilot said, it is very difficult to differentiate between a change brought about by such an operation as Dr. Pearlman

performed on young rabbits and a hyperesthetic rhinitis that has been going on for many years. In the cases of hyperesthetic rhinitis the mucosa shows a marked thickening, and perhaps if the rabbits could have been kept alive, changes like those of hyperesthetic rhinitis would be found.

I wish to report twenty cases of hyperesthetic rhinitis in which the basal metabolism was taken according to the method I outlined at the meeting of the Academy two years ago. The metabolism ranged from 10 to 50 per cent minus, and these patients improved on the administration of thyroid extract so that when the metabolism reached normal or plus, they became free from symptoms.

DR. S. J. PEARLMAN, Chicago (closing): As was stated by others and ourselves, it would be rash to compare with great finality results of animal experimentation with conditions in the human; but there are a number of diseases which in the human and in the animal resemble each other closely. One may say, with perfect safety, that experimental diabetes and experimental cretinism are so similar to these diseases in man that we may properly draw conclusions applicable to both animals and humans. But even here, the symptoms vary in different animals. For instance, the coarse short hair, said to be so characteristic of cretinism, is not seen in this disease in the goat; myxedema does not appear in all species.

In answer to Dr. Pilot's question as to whether there was a rhinitis or not, we cannot say as we did not look for it. It is difficult, furthermore, to keep rabbits alive under ordinary laboratory conditions. Somehow or other, they do not thrive. We managed to keep operated animals with their controls alive and in good health up to the ages of two, four and seven months. The death of an operated animal or its control vitiates that particular experiment, and numerous deaths occurred.

We attempted no correlation with similar conditions in the human; it is also no less difficult to observe marked hypothyroid symptoms in man. The surgeon checks his results with basal metabolic rates as soon after operation as possible and gives thyroid medication at once where indicated. One would be naive indeed to expect a surgeon to discontinue thyroid feeding in the cases of his patients in order that we might

observe nose and throat changes and take specimens for microscopic study.

In answer to Dr. Novak: The symptoms that follow total removal of the thyroid are very marked. I do not know how easy it would be to produce mild cretinism in animals. As to studying these animals over a long period of time so as to get a condition comparable to hypothyroidism in the human, we must not forget that the life span of a rabbit is so short that periods of from two to seven months are comparable to many years in the human.

Drs. Ellison L. Ross and Murland W. Fish, Waukegan, Ill., presented a preliminary report on

"Response of Vestibular Apparatus to Drugs."*

(Abstract.)

In order that the results might be most directly applicable to medical practice, mutilating operations, employment of lower forms of animal life and unphysiologic methods of stimulation were avoided as much as possible. Dogs were used as subjects. No operations were performed. The method of stimulation was rotation with the dog's nose in the vertical plane, the duration of nystagmus was taken as the measure of the degree of stimulation. The dog was tightly tied to a specially constructed board so that no part of the body could change position. A large leather muzzle, fitted with a 20 diopter lens, was placed on the dog's head in such a way that one eye was covered with leather and the other with the lens. The board was then attached to a vertical bar which by means of an electric motor was rotated at a constant rate of about thirty-five turns per minute. From a series of tests we decided that rotation for fifteen seconds with a sudden stop produced a vestibular stimulation which was not maximum and still large enough to allow a considerable diminution. After the sudden stoppage of the dose of rotation, the duration of nystagmus was timed with a stop watch. The interval between tests was always five minutes. Usually three tests were made before

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the drug was administered. The drug was always injected intraperitoneally. Two minutes after the drug was given the next test of rotation was made. The tests were continued for about an hour after the drug administration. Four drugs altered the vestibular reaction. Epinephrin increased it while sodium nitrite, cocain and pilocarpin decreased it. Why epinephrin should increase vestibular reaction cannot at present be proved. The primary action of this drug is to stimulate the endings of the thoracolumbar sympathetic nerves. A great many physiologic changes take place as a result of such stimulation. One of the most marked changes is the quick rise of blood pressure. The fact that sodium nitrite reduces blood pressure and in our group of animals reduced labyrinthine reaction, argues in favor of blood pressure being an influential factor in vestibular irritability. Cocain and nicotin both stimulate the thoracolumbar sympathetic system but not so violently as epinephrin. In addition there are many side actions, such as anesthesia and ganglion depression. Both drugs increase blood pressure but not as violently as epinephrin. The lack of influence of nicotin on vestibular reaction is evidence favoring the view that no sympathetic ganglion is involved in the reaction of the vestibular apparatus to rotation. If the vestibular nerve had any of the properties of the craniosacral sympathetic it would be depressed by atropin and stimulated by pilocarpin. Our results show no action on the part of atropin, and a depression instead of a stimulation by pilocarpin. Therefore, our data lead us to the conclusion that the vestibular nerve has no properties of the craniosacral sympathetic nerves. The reason for the depression produced by pilocarpin was probably due to one or both of two things. The dose of pilocarpin was large and produced marked diarrhea and general depression. Possibly, there was considerable reduction in blood pressure as a result of the decrease in heart rate and loss of body fluids through the diarrhea. While none of the animals died, the general depression was great. This alone is sufficient to reduce the reaction of the vestibular apparatus to stimulation. This is considered by us to be the most influential factor, if not the only one, in both cocain and pilocarpin producing a reduction in vestibular reaction. Further work is being done by us on the effect of drugs on the vestibular mechanism.

DISCUSSION.

DR. J. GORDON WILSON, Chicago: These are the results of an investigation on a most difficult subject, carefully planned and admirably worked out. Those who recall the paper of Dr. Ross on the combined action of cocain and adrenalin will note the same painstaking tabulation of results. Experimental work dealing with the effect of drugs on the ear has been very scarce. I can recall none in this country and little in any country. This is not to be wondered at when one understands the experimental technic necessary and the pharmocologic and physiologic knowledge required. Yet if we are to apply our remedies scientifically such fundamental details are necessary.

There are several ways in which Dr. Ross might have studied these drug effects. He might have studied the effects on peripheral muscles or disturbances of postural reflexes. He did well to limit his observations in this preliminary paper to the effect on the eye musculature. In the eye we are dealing with a reflex which is fairly well known, at least so far as the primary peripheral reflex is concerned. We are also dealing with the most accurately balanced mechanism in the body. His observations have been made on their effect on rotation with both labyrinths intact. In a preliminary report I agree with him that rotation is to be preferred to caloric.

From a new angle we have presented evidence that the vestibular nerve is to be differentiated from the sympathetic. No other deduction seems possible when one compares his results on the vestibular mechanism with the recognized actions of atropin and pilocarpin on the sympathetic. The vestibular nerve is to be classed in the same category as the auditory and the optic. Yet not quite—it is "unorthodox." If one destroy the optic nerve blindness results, if the auditory nerve, hearing goes. In both these cases no mechanism is present to compensate to any marked degree. But destroy the vestibular nerve and we get wonderful compensation and that very quickly. In a day or two, so far as nystagmus is concerned, the animal appears normal. This rapid compensation makes the reaction of drugs difficult to interpret, when tests are carried on over a series of days. Previous work on the effect of drugs

has been done chiefly on guinea pigs and rabbits—spinal animals. Dogs, in so far as they more closely approximate man, give a better foundation for clinical application. I hope he will carry this work higher up the mammalian scale to monkeys.

It is interesting that epinephrin is the only drug Dr. Ross found to stimulate the mechanism. But we must not get the idea that this is the only one. Camphor will do it, but Dr. Ross did well to limit himself. There are many things we would have liked to have Dr. Ross tell us, such as his observations on the smaller dosages. Previous workers have found that it was possible with certain drugs (e. g., nicotin) in smaller doses to eliminate the quick component while the slow persists —a phenomenon not to be wondered at when one thinks of the different cerebral levels involved. One of the most interesting drugs in its results on the vestibular mechanism which has been reported on by other authors is cocain applied locally, in that it first acts on the utricle, then on the canals; this ought to be repeated.

In a work such as this, to draw conclusions is difficult, and so an important part in this paper is the way in which the results have been tabulated and graphed, so that one may get a clear idea of their action. I congratulate Dr. Ross on his presentation of an interesting paper in a very difficult field of vestibular investigation, and await with pleasurable anticipation future results.

Dr. George E. Shambaugh, Chicago: I should like to ask Dr. Ross whether he has tried the effects of quinin on the vestibular nerve. Many years ago Charcot used quinin for patients suffering with the Ménière syndrome. He thought of using quinin because of the known effects upon the eighth nerve—tinnitus and deafness. Even to this day quinin is used more or less by internists for just these cases. I understand it is given in rather small doses over a considerable period, and I am wondering whether there is any definite proof that quinin in any way affects the vestibular nerve, but we do know it acts upon the auditory nerve. An optimistic internist administering quinin for patients suffering with the Ménière syndrome will always get a favorable report, provided he continues the use of the quinin long enough, for the reason that the disturbance of equilibrium from any source except when due to

intracranial conditions is a temporary phenomenon. The disturbances of equilibrium where there is a degenerative process involving the eighth nerve last all the way from a few seconds or hours to a few days. It is easy for anyone who believes in drug therapy to find encouragement under circumstances of this sort.

DR. ELLISON L. ROSS, Waukegan, Ill. (closing): These experiments are merely introductory and not conclusive. They are only suggestive. We will in our future work use these drugs in various doses. Within certain limits our results show the effects of increasing amounts of the drugs. This is accomplished through the frequent observations during the time of absorption. The drugs that I have found to reduce the sensitiveness of the labyrinth to stimulation, I think owe their action, at least in part, to the general prostration of the animal. This point will need consideration.

I have not tried quinin. There will be some difficulty in determining the action of this drug on the vestibular apparatus. It may require a number of days for quinin to develop its effect. Because of the relatively quick adjustment of an animal to changes in the sensitiveness of the labyrinth, it will be quite difficult to measure these changes if such occur. This is appreciated when a labyrinth of a dog is destroyed one day, and the second day following the animal has quite well reestablished his equilibrium and no nystagmus is present. It may be that rotation tests will demonstrate slow alternations in the sensitiveness of the vestibular apparatus. We will investigate this point.

DRS. FREDERICK A. FIGI and GORDON B. NEW, Rochester, Minn., presented a paper on

"Carcinoma of the Larynx in the Young."

(ABSTRACT.)

In a group of more than 380 cases of carcinoma of the larynx examined in the Mayo Clinic during the last ten years, more than 84 per cent occurred in patients between forty and seventy years of age, 9 per cent occurred in patients between seventy and eighty years of age, and 5 per cent in patients under forty years of age. Recognition of the fact that carcinoma of the larynx may occur early in life is of great im-

portance from the standpoint of diagnosis and treatment. The possibility of earlier lymphatic extension in young patients must also be considered. Should the clinical picture and laboratory data fail to establish a diagnosis, biopsy should not be delayed unduly.

DISCUSSION.

Dr. Joseph C. Beck, Chicago: I think only a man from such a place as Rochester can bring us material from which we can gather statistics regarding carcinoma, particularly in the young, and it is in the young individual that operation is of great value. I will show you several young persons, who are very happy in that they have escaped death from carcinoma of the larynx. Unless we can get the patients very early in the course of the disease all methods of treatment other than laryngectomy seem to fail. In some of the cases we can remove the larynx and hope for the development of a voice by means of the splendid artificial larynx of Dr. Mackenty. The first patient is one of our State Senators, forty-two years old, who was recently operated upon and is learning to talk with the artificial larynx. The next one is the youngest patient I have operated upon by laryngectomy, a man, aged twenty-nine. He has had a splendid opportunity for developing his voice and is working every day. He wears a cannula, to which he does not object in the least. In this case the original condition was an adenocarcinoma as well as a squamous cell carcinoma, so diagnosed by Dr. Hektoen and Dr. Pilot. The next case is interesting, in that the patient was supposed to have an inoperable carcinoma, but I undertook the removal of the larynx, the anterior part of the esophagus, the muscles of the neck with all the glands as well as the internal jugular vein. He now wears the Mackenty artificial esophagus. He is improving in health, and later we will do a plastic operation, but during the time that he is getting stronger it is an excellent thing to have the artificial esophagus. In another patient (photograph shown), aged thirty-one, who is not here, I removed the growth completely by means of electrocoagulation more than a year ago, and he now has a very good voice.

By getting these cases early and not fearing that a biopsy will spread the growth, I think there is no greater risk in these

procedures than in leaving the growth alone, for it surely will spread.

I have permission from Dr. Mackenty to present his youngest case, which occurred in a girl, aged eighteen years. I have here a photograph of the larynx and also of the patient.

New and Mackenty have done a great deal, particularly Mackenty, who has given us a modified technic whereby we can save lives. The young man should understand this operation and should undertake it without any hesitation, provided he learns how to do it well.

Dr. Thomas C. Galloway, Evanston, Ill.: Dr. Figi mentioned only two alternatives in treatment, complete laryngectomy and laryngofissure with excision. Dr. Beck hardly mentioned his case of electrocoagulation. Our results with electrocoagulation in cancer about the head and neck generally have been so satisfactory that we felt it would be good in early carcinoma of the larynx. The immediate results in two recent intrinsic cases, of laryngofissure with electrocoagulation, have been excellent. It seems almost as safe as laryngectomy, for we can easily destroy all the visible malignancy, and if the growth has extended beyond the cartilage we can follow it by the tactile sense. If the removal is incomplete, we need not be without hope of picking up the recurrence later, which may not be true of excision.

The lack of postoperative reaction was marked. One patient did without the Rehfuss tube in five days and the other swallowed normally in six. There was none of the prostration or other complications so likely to occur in the hands of men less competent than those at the Mayo Clinic and Dr. Mackenty. I think this should be safer than the St. Clair Thomson method and almost as safe as laryngectomy, though our work is too recent for statistical support. It should be given serious consideration, especially in the young.

In the first case (with Dr. Lewy) we made the skin incision with the knife and cut the cartilage in the midline with the saw, retracted and coagulated with a needle the rather extensive growth on both cords and as far down as the first tracheal ring, using the button electrode in one place where the growth seemed thicker. The coagulated tissue was curetted out. In the second case (with Dr. Cottle) he went through the

skin and cartilage with the cutting current and coagulated with a needle electrode. Local anesthesia, blocking the superior laryngeal after Brann's method, was very satisfactory. Tracheotomy was done at the time of operation in one case, previously in the other. Both cases involved the anterior commissure and anterior half of the cords. A posterior growth would probably be unsuitable for this method. We think both paitents will have good airway and probably fair voice.

Dr. Alfred Lewy, Chicago: The immediate operative result in these cases is very satisfactory, but neither of these cases is old enough to know what the ultimate result will be. The operation consists of tracheotomy, laryngofissure, coagulation of the growth and packing. The Rehfuss tube was used in my cases for about six days.

Question: Is that a case in which laryngofissure was indicated or total laryngectomy?

Dr. Lewy: My man had quite an extensive growth extending from the epiglottis downward, involving the region of the cricoid, and we were not sure whether the thyroid cartilage was perforated at one point. I would say that under the usual indications total laryngectomy was indicated. We are interested in learning if laryngofissure and electrocoagulation will not serve as well.

Dr. George W. Boot, Chicago: I wish to confirm everything that Dr. Galloway has said. His results at Cook County Hospital are so far ahead of anything we have ever been able to get there by other methods that there is no comparison. Our county cases are usually in the later stages when we get them.

I am particularly interested in the question of the etiology of cancer. If there is anything that scientific men have been agreed upon it is that acquired characteristics are not hereditary. I have never known of any of my white mice developing cancer spontaneously, yet I can cause it to appear in any of them in about two months' time. Does that not look like an acquired characteristic?

Apparently cancer is due to a slow biochemical change going on over a long time. I have been reviewing the histories of cancer of the ear, nose and throat in Cook County Hospital and find in most of them one notation which I consider sig-

nificant, "Teeth in bad condition." This is so common that I cannot help but think that it may be a large factor, and that the chemical change, whatever it is that stimulates the cells to run riot, may result from the dirty mouths and teeth.

There is a certain microorganism that is quite constantly present in cancer—the micrococcus neoformans of Doyen—the same bacterium that is described by Nuzum. I have found it eighteen times out of twenty in pure culture in carcinomatous glands removed aseptically. What its relation to cancer may be I am not able to state. I have not been able to reproduce cancer with it.

Dr. Frederick F. McCarthy, Cincinnati, Ohio: I wish to mention three cases in which I have used surgical diathermy in early carcinoma. One had refused laryngectomy. These patients are all living and apparently doing well. However, the possibility that worries one in the use of surgical diathermy in this area is that of the development of tracheoesophageal fistula. I wonder if anyone here has had this complication following the use of surgical diathermy.

Dr. Fred A. Figi, Rochester, Minn. (closing): I wish to congratulate Dr. Beck on the cases he presented, particularly the one with very extensive involvement. I feel that some of these patients with extensive cancer of the larynx have lost their only chance of getting well because of our timidity in this regard.

The comparatively slight disability in these laryngectomized patients might well be emphasized. Most of them are able to pursue their original occupation with little inconvenience. One patient whose growth was so extensive at the time of admission that immediate tracheotomy was necessary, later had a laryngectomy and has been carrying on work necessitating his meeting people and doing a great deal of talking. This was accomplished through the use of a Mackenty-Graybar type of artificial voice box.

We, too, have used electrocoagulation but practically always in conjunction with laryngofissure. This group was not mentioned, as we have considered them along with the thyrotomy cases.

The disadvantage of wearing tracheal cannula following laryngectomy has been mentioned. I am inclined to question,

however, whether this is a real disadvantage. Some of our patients have found it easier to manipulate their artificial voice box by wearing a cannula and prefer to do so.

I wish to affirm what Dr. Boot said regarding the association of dental sepsis and malignancy of the oral cavity and upper respiratory passages in general. This has been a very frequent observation in my own experience.

DR. L. A. SCHIPFER, Chicago, Ill., read a paper on

"Practical Consideration of Sinus Disease in the Young."

(ABSTRACT.)

Sinus disease is an ever increasing problem, due largely to the greater frequency of the principal causative agent—upper respiratory tract infections. The reasons for this increase in the incidence of these infections are the greater congestion of population, more rapid transportation, and the change of a large proportion of the population from outdoor to indoor occupational pursuits.

The treatment of the acute condition consists of the use of mild astringents, bland oils and antiseptics locally, cleansing of the throat and nose as well as possible, irrigation and negative pressure if practicable, and operation only rarely. As soon as the acute general infection has been thoroughly eradicated, and the patient is subjected to a tonsil and adenoid operation if indicated, the antrum washing in the case of maxillary sinusitis may be carried out at the same time. When the other sinuses are involved without the maxillary it is advisable to get as good ventilation as possible by the tonsil and adenoid operation, reserving further surgery to a later date, and to use conservative measures for a considerable time.

Even in chronic cases of ethmoiditis with degenerated middle turbinates, and polyposis, one need not remove any of the turbinal tissue beyond an amount barely sufficient to permit the application of local treatment. It is often amazing to see what comparatively quick and excellent results follow this treatment. In chronic sinusitis the pus must be evacuated by operation or whatever method accomplishes this result. Then dietetic and, if practicable, climatic treatment should be instituted and carefully supervised.

DISCUSSION.

DR. ARTHUR W. PROETZ, St. Louis: I am heartily in accord with Dr. Schipfer's contention that recognition and successful treatment of sinus disease in the young is a cardinal factor in the prevention of similar disease and its sequelæ in adult life.

I am likewise of the opinion that this condition should be and is peculiarly amenable to nonsurgical treatment in most cases.

Aside from the obvious recency of the pathologic processes in children, I can find nothing to distinguish them from similar processes in their elders. There is one anatomic distinction, however, which permits the more conservative treatment in the child, namely, the size of the ostium relative to the capacity of its sinus. The ostium at term is commonly one-fifth to one-third of its adult size, whereas the sinus which it drains may increase one or two hundredfold in cubical content.

Our studies with radiopaque oils, while far from complete, demonstrate that fluids penetrate the sinuses of children more readily than those of adults, and, as may be expected, they are far more quickly expelled. This at once indicates the greater accessibility of the child's sinus to treatment solutions and the relative facility with which drainage and aeration may be restored.

My conception of sinus disease is nothing so obvious as the condition which Dr. Schipfer describes. It seems to me that the most troublesome cases which come to hand are not those characterized by the "formation and retention of purulent secretion within the sinuses," which replaces the normal content of air. I am convinced that the greatest mischief is often the result of deep infection of the mucosa unattended by any great formation of pus and certainly not characterized by such gross pathologic changes as would materially reduce the amount of air in the sinus.

I was much impressed, during the recent meeting of the Radiological Society of North America, by a series of radiographs demonstrating ethmoiditis in infants twenty-three months of age; apparently all that is necessary to produce sinus disease is one microorganism and a mucosa, however young.

I will mention treatment only to say that after three years' special attention to the possibilities of irrigation, I am more firmly convinced than ever that it is a deleterious, not to say dangerous, procedure in the early stages of nasal infection.

DR. DANIEL W. LAYMAN, Indianapolis, Ind.: In this discussion there are certain facts I wish to bring out in considering the treatment of diseases of the nasal sinuses by displacement irrigation with suction.

The first is that I am still enthusiastic about displacement irrigation. I have treated all kinds of cases of nasal sinus disease, and the results in most cases have been satisfactory, especially in the treatment of the posterior series of sinuses. When I first commenced displacement treatments, I treated very few acute cases but rather those in the late stages. As Dr. Proetz had emphasized that he did not use the displacement treatment in acute cases, I proceeded very cautiously. The selected cases I did treat, however, encouraged me to believe that acute antrum and acute frontal sinus disease were greatly benefited by the displacement treatment, provided a certain technic was followed in preparing the nasal cavity for the treatment.

The treatment consists of displacement irrigation of the antrum, with suction, after the nasal cavity (at least that part of it posterior to a perpendicular line running through the maxillary ostium) has been packed or blocked off with absorbent cotton slightly impregnated with mineral oil. The mucous membrane of the nasal cavity is cocainized, the ethmoid mass and sphenoid are well packed off from the anterior nasal cavity by pledgets of cotton inserted into the inferior and middle meati, enough cotton being used to completely fill the spaces between the turbinates and septum and turbinates and outer wall, care being taken not to pack over the maxillary ostium. The patient is placed in the Proetz position and first the maxillary ostium is made more patent by instilling 1 to 2 cc. of an ephedrin-cocain solution; a few alternations or compressions of the bulb will suffice. The solution passes through the ostium and will shrink the mucous membrane. Then the displacement treatment is carried out in the usual manner. After the instillations of 2 to 4 cc. of the irrigating fluid (warm saline), in-

termittent suction is applied. This is repeated until the antrum overflows, then the anterior nasal cavity is filled with the fluid and a stronger solution employed (suction alone without compression).

In this manner I have obtained returned irrigating fluid or washings filled with mucopurulent secretions. In some of the cases the shreds and pus in the washings have been as marked as in the cases that were irrigated through antra-meatal puncture. After two or three displacement irrigations Nature seems to help out, at least the antra seem to drain better. In the later stages a solution of neosilvol or metaphen is displaced; such antiseptics help considerably in clearing up the infected antra.

I hope some time later to present roentgenograms that will show the exact location of the packing which blocks off the ethmoid and sphenoid sinuses, and also to present X-ray pictures that will show the antra before and after treatment. The only cases of acute antrum disease treated by displacement irrigation with suction were those in which the patient refused to submit to an antral puncture and irrigation. In most of these cases it was interesting to note that the results were as good as if the antral puncture had been used.

Dr. Gordon F. Harkness, Davenport Iowa: I think we are all agreed regarding the conservative treatment of the infected sinuses, but I wonder if we do not sometimes look upon such patients from a too strictly rhinologic standpoint. Climate seems to have at least a temporarily beneficial influence. I offer the suggestion that along with our local treatment we inquire about the home conditions of the patient. The average heated dwelling places the patient in an environment dryer than the Sahara desert. From this atmosphere the patient is frequently going to and returning from the outdoor atmosphere of an entirely different humidity. Such sudden changes in humidity tend to break down mechanism of the nasal mucosa. Attention to the factor of the humidity of heated buildings will often accomplish as much as local treatment.

Dr. Richard E. Mercer, Detroit, Mich.: I think we are getting at these cases from the wrong direction. The meeting of the section in the South last year gave us a good deal of

food for thought. William Weston claims that most of these cases are due to poor nutrition, that the deformities are not the result of sinusitis, but in the great majority of cases the cause thereof. He has done a lot of experimental work, and he believes that the influence of certain factors in nutrition, particularly in the nose and throat, with the changes in the arch and the greater liability to infection, are the underlying factors in the sinus conditions, particularly in children. We cannot get at this cause in the adult, for the anatomic basis is fixed, but we can attack it in children. He has found that a relative increase in vitamin B over vitamin A is one factor in hypertrophy. He has also observed that the mineral salts are a great factor. I think if we look more to the underlying cause than to local treatment we will get better results. I have seen many cases of sinus disease in children improve rapidly without any local treatment whatever.

Dr. Walter H. Theobald, Chicago: It is a pleasure to listen to such conservative statements as Dr. Schipfer and Dr. Proetz have made. I think in the majority of cases these are the principles to follow, but there are obstinate cases which require a little more radical interference. I have two such cases in mind. One was that of a child, aged nine, with a constant drooling discharge from one nostril. Transillumination showed cloudiness, and washing out the antrum brought about recovery. In another child, aged seven, with antrum infection confirmed by transillumination and X-ray film as well, after prolonged local treatment, a chronic drooling discharge persisted. The child was taken to the hospital and under ether anesthesia the antrum was irrigated. Surmising that perhaps it would have to be washed out again later, I rasped a small opening in the inferior meatus with the idea that I might gain the confidence of the child and irrigate it later in the office. The child improved for about a week, and then the discharge reappeared. Finding that it was impossible to wash out the antrum in the way I had planned, he was taken back to the hospital and the antrum washed out again under general anesthesia. On each occasion a large mass of mucus was washed out. Following this treatment there has been no further discharge during the past three or four months, which is evidence that the child is relieved from his chronic sinus infection.

DR. WILLIAM V. MULLIN, Cleveland, Ohio: All this discussion is very good, but we must also take a practical view of the situation. A certain number of children and adults have sinus disease. Regardless of how we believe in treating them, conservatively or not, depending on the condition found at examination, something must be done for them, or they may go on to secondary complication. If a mother brings you a child with both nostrils swollen shut and mucopus coming out of the sinuses, you cannot deliver a lecture to her on vitamin A and B and send her away. If anyone thinks that children living in the Southwest and West do not have sinus disease, all he has to do is to practice there when one of the acute epidemics occurs and he will find out. As long as we have the acute cold we will have a certain amount of sinus disease, and all children that have it are not improperly fed or housed.

We cannot draw a sharp line and say that merely the nasal chambers are involved in an acute cold and not the sinuses. It is the same mucous membrane lining the entire tract and it is all inflamed. One or more sinuses may not recover as well as others due to morphologic change affecting ventilation or drainage. We must bear in mind the predilection of certain epidemic infections for certain tissues at different times. In the present epidemic of so-called "flu" passing over the country, practically all the cases started with a laryngitis, tracheitis and severe cold —not much involvement of the nose or sinuses. At other times we have all seen the middle ears affected in a very short time after an acute infection has started; at times it will be tonsillitis, or sinusitis, and so on. A great deal can be done in the treatment of sinus disease in children. It is true a change of climate may help, but it is due in many instances to a complete environmental change; if a sinus is badly infected it must be taken care of in a good climate as well as a poor one.

DR. EDWARD KING, Cincinnati, Ohio: In speaking of chronic conditions, I think it is essential to inquire into home conditions to ascertain whether some of the older members of the family have a sinus infection. This is often the source of the recurring infection in children. In regard to the treatment of the chronic cases, I believe that you will find the middle meatus route the most efficacious. A child seven or eight years of age

will submit to a washing through the middle meatus, whereas it will not permit the puncture under local anesthesia. If you have not attempted it, I am sure that you will be surprised at the ease with which the middle meatus is entered in children.

Dr. Austin A. Hayden, Chicago: I differ from Dr. King in his statement that we are talking about chronic sinus conditions. Probably we are for the most part, but occasionally an acute sinus condition in a young child may become a very serious proposition. I recall two cases in children under three years, and wish to discuss first the conservative treatment of these. Both had a large swelling below the eye and on the nose. The first of the cases was dealt with very radically. The child's skin was incised, the bone uncovered and the necrotic bone removed; that patient died.

In the second case fully as large a swelling was seen about three days after the child had had only a moderately severe head cold. The only symptoms the mother noted was that the left eye teared quite easily, and was very sensitive to light. The following morning the eyebrow was much swollen. I saw the patient about thirty-six hours later, and the eye was so greatly swollen that it was impossible for the patient to open it, and it was almost impossible to expose the cornea with a lid elevator. From that child's antrum we got a tremendous mass of thick pus within seventy-two hours of the appearance of the first symptoms. The eyebrow was incised along the nose, and pus evacuated without searching for or removing any necrotic bone in that region; the antrum was packed and subjected to suction. That patient recovered, but convalescence was complicated by a septal abscess, with almost complete necrosis.

I have no doubt that the swelling of the eye was due to a ruptured ethmoid cell. The roentgenograms were quite unsatisfactory, but after a period of about eight months the child is entirely well, with a very large septal perforation. I think conservatism is to be practiced in these cases.

Dr. H. W. Dale, Chicago Heights, Ill.: I would like to know whether there was any pus within the orbit in Dr. Hayden's case.

Dr. Hayden: At no time was there any pus in the orbit.

DR. L. A. SCHIPFER, Chicago (closing): I can answer a good many of the questions in one: I think conservative treatment for one case is radical for another. Each case is individual and should be considered so. Change in social conditions is often necessary, and dietary measures have been essential in many cases. The acute cases must be treated conservatively. In some cases washing the antrum is not necessary; in others it is demanded. There is no doubt that climatic conditions have some effect, and when patients go West from the eastern part of the country they often recover completely.

Contributors to This Number

Francis P. Emerson, Boston, Mass., requires no introduction to the readers of the Annals. Dr. Emerson's first contribution to this Journal, "*Developmental Absence of the Outer Right Sphenoidal Wall*," appeared in 1908. Since that time his thoughtful articles have appeared in almost every volume of this Journal. He is a member of the Editorial Board.

Alexander G. Fetissof, Assistant Professor in the Clinic of the State University, Tomsk, Siberia, writes in this issue on the "*Pathogenesis of Osteomas of the Nasal Accessory Sinuses.*" Dr. Fetissof's previous contributions have been confined to Russian medical journals. The present essay has been translated by Alexis A. Sheremetefsky.

James A. Babbitt, Philadelphia, is Assistant Professor of Otolaryngology in the University of Pennsylvania School of Medicine and in the Graduate School of that institution. His contributions have been chiefly on otological subjects, including several studies of lateral sinus thrombosis. He contributes the article "*Coincidence of Meningeal Calcification and Nasal Pathology*" to this issue.

Margarete Meta Kunde is Research Associate in Physiology and Instructor in Medicine at the University of Chicago. She is author of a score of articles, chiefly upon dietetics and metabolism, most of which have appeared in the American Journal of Physiology.

Myron E. Kahn is Clinical Instructor in the Department of Otolaryngology, University of Chicago.

Charles W. Richardson of Washington, D. C., is the retiring President of the American Laryngological Association. His President's Address in this issue was read before that body in May. Dr. Richardson is a Trustee of the American Medical Association and has long been active in national medical matters.

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MORRIS A. WEINSTEIN is Assistant Professor of Otology in the Graduate School of Medicine in the University of Pennsylvania.

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SAMUEL J. PEARLMAN, co-author of two articles in this issue, has a long list of thoroughly scientific contributions on pathological and bacteriological subjects to his credit. This is his second appearance in the ANNALS. He is on the staffs of Michael Reese and Cook County Hospitals, Chicago.

FREDERICK A. KIEHLE is Clinical Professor in the Department of Ophthalmology, University of Oregon Medical School. Beside several ophthalmological articles, he has published a number of essays on general medical subjects.

EDWARD D. KING is Associate Professor of Laryngology at the University of Cincinnati and on the staffs of several Cincinnati hospitals. He has been an active contributor to laryngological publications since 1923. His later work has been chiefly on bronchoscopic subjects.

JEFFERSON BROWDER is Assistant Professor of Surgery at the Long Island College Hospital in Brooklyn.

EARL B. BROOKS is Ophthalmologist and Otolaryngologist to the Lincoln (Neb.) public schools. In his current article, "*The Incidence of Ear, Nose and Throat Disease in Lincoln School Children*" he suggests a highly practical system of public school survey.

MONTIE C. COMER, whose "*Analysis of Five Hundred Tonsillectomies*" appears in this issue, is Otolaryngologist to the Thomas-Davis Clinic in Tucson.

J. MACKENZIE BROWN, author of the article "*Sinusitis in Children*" in this book, is Chief of Otolaryngologic Service at Children's Hospital in Los Angeles. He has contributed numerous articles on laryngologic and otologic subjects.

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